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REVISION 1

REMEDIAL DESIGN WORK PLAN

Prepared for:
ORMET PRIMARY ALUMINUM CORPORATION
SUPERFUND SITE
HANNIBAL, OHIO

JOB NO: 07983-032-006
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1.0 INTRODUCTION

This document presents the Remedial Design Work Plan (Work Plan) for the Ormet Primary Aluminum Corporation (Ormet Primary) Superfund Site located in Hannibal, Ohio. The United States Environmental Protection Agency's (U.S. EPA's) remedial alternative selection for the site was presented in the Record of Decision executed on September 12, 1994. This Work Plan has been prepared in compliance with the Consent Decree between the United States (U.S.) and Ormet Primary. This Work Plan incorporates the requirements and guidelines of the Record of Decision, the Statement of Work, and the U.S. EPA's *Superfund Remedial Design and Remedial Action Guidance* (OSWER Directive 9355.04-4A).

2.0 BACKGROUND

The Ormet Primary Superfund Site is located adjacent to the Ormet Primary aluminum reduction facility (reduction facility) in Monroe County, Ohio, approximately 2.5 miles north of Hannibal. The site is situated on the west bank of the Ohio River, and occupies an area of approximately 47 acres east of the reduction facility. Beginning in the early 1970s, Ormet Primary implemented a series of hydrogeologic investigations to identify the source of alterations to ground water being captured by the reduction facility ground water production well (commonly known as a "Ranney" well). These investigations determined that the constituents were entering the ground water from a portion of the site east of the production areas, where historic on-site material storage and disposal activities had occurred.

The identification of ground water contamination by Ormet Primary and the U.S. EPA's determination that the aquifer was a potential drinking water supply ultimately led to the site being placed on the National Priorities List (NPL). In response to this action, Ormet Primary, the U.S. EPA, and the Ohio Environmental Protection Agency (OEPA) entered into an Administrative Order by Consent (Consent Order) for Ormet Primary to implement a Remedial Investigation/Feasibility Study (RI/FS) at the site. The resulting Feasibility Study (FS) Report described a range of remedial actions to address conditions that were determined by U.S. EPA to pose an unacceptable level of risk to human health and the environment (based upon hypothetical exposure scenarios that include ground water consumption, trespassing, and fish ingestion). Following submittal of the FS Report, U.S. EPA prepared a document that described the agency's proposed cleanup plan, including its recommended remedial alternative for the site, and solicited public comment on the plan. Following the completion of the public comment period, U.S. EPA issued a Record of Decision describing proposed remedial actions for the site. The remedial action components specified in the Record of Decision consist of the following:

- Continued pumping of the Ormet Primary reduction facility Ranney well and existing interceptor wells to maintain capture of the contaminated ground water, and treatment of the water from the interceptor wells prior to discharge.
- Treatment of residual soil contamination existing in the Former Spent Potliner Storage Area (FSPSA) by in-situ soil flushing.
- Excavation of contaminated soil from the Carbon Runoff and Deposition Area (CRDA) and consolidation under the cover of the Construction Materials Scrap Dump (CMSD).
- Removal of contaminated sediment from the Outfall 004 Stream Backwater Area (Backwater Area), and consolidation under the cover of the CMSD (for materials exhibiting polychlorinated biphenyl (PCB) concentrations less than 50 parts per million [ppm]) or off-site disposal.
- The installation of trench drains to collect leachate seeping from the CMSD and, if necessary to meet National Pollution Discharge Elimination System (NPDES) permit limits, treatment of the leachate, as necessary, prior to discharge.
- Recontouring and capping of the CMSD with a dual barrier cap meeting the requirements of the Resource Conservation and Recovery Act (RCRA), Subtitle C.
- Implementation of Institutional Controls to limit the use of ground water and future land use.

A brief summary of information regarding the facility and specific areas of interest is presented below. For additional information regarding the site, the reader should refer to the agency-approved Remedial Investigation (RI) Report (Geraghty & Miller, December 1993).

2.1 GENERAL FACILITY INFORMATION

The Ormet Primary Superfund Site is located on the west bank of the Ohio River approximately 2.5 miles north of Hannibal, on an area known as Buck Hill Bottom, as shown on Figure 1. Buck Hill Bottom occupies a portion of the Ohio River Floodplain that formed as river sediments were deposited on the inside of a meander bend and extends over an area of approximately 500 acres. The area is bounded by Ohio State Route 7 to the north and west and the Ohio River to the south and east. The Ormet Primary Superfund

Site occupies the northeastern portion of the bottom land, the Ormet Primary reduction facility occupies the central portion of the bottom land, and the Ormet Aluminum Mill Products Corporation rolling mill (rolling mill) occupies the southwestern portion of the bottom land. The Ormet Primary Superfund Site (encompassing the Backwater Area, former disposal ponds, FSPSA, CRDA, and CMSD) is located immediately to the east of the reduction facility. The relative locations of the referenced areas on this portion of the facility are depicted on Figure 2.

Topography

As shown in Figures 3 and 4, current topography in the area of the Ormet Primary Superfund Site is relatively flat to moderately sloping, with surface elevations predominantly ranging from 640 to 680 feet, except immediately adjacent to the Ohio River. A relatively steep bank exists along the edge of the river, with surface elevations ranging from approximately 623 feet (the current normal pool elevation of the Ohio River) to 645± feet.

Climate

The site is located in a temperate climate, which experiences four distinct seasons (spring, summer, autumn, and winter). The summers are typically warm and humid, and the winters cold and cloudy. During summers, temperatures typically reach 90°F or higher on about 20 days. During an average winter, there are nearly 100 days where the daily temperature falls below freezing (32°F), 20 days where the maximum daily temperature is below freezing, and a few days when the temperature falls below 0°F.

Precipitation is normally abundant and well distributed throughout the year, with peaks in early spring and summer. The average annual precipitation, including snowfall, in the vicinity of the site is approximately 39 inches. On average, the area receives 3 to 5 inches of precipitation per month during spring and summer (March through August) and 2.5 to 3 inches of precipitation per month during autumn and winter. Annual snowfall averages nearly 29 inches, and occurs predominantly between November and March. Although individual snowfalls may be heavy (in excess of 6 inches of accumulation from a single storm), they are commonly followed by periods of thawing that leave no significant accumulation for melting in the spring.

Hydrogeology

The Ormet Primary property is typically underlain by alluvial deposits, the most notable of which are the sand and gravel (referred to as glacial outwash), which form the matrix of an alluvial aquifer. The sand and gravel deposits are fairly continuous down to bedrock, at a depth commonly ranging from 50 to 100 feet below land surface. Toward the valley wall, the sand and gravel deposits are commonly intermixed with and/or capped by colluvial material (clay, silt, rock fragments and other mudslide-type debris) derived from weathering and mass wasting of the highlands and the valley wall. Consequently, the relative abundance of fine-grained material increases beneath portions of the site that are nearer to the valley wall (i.e. northern portions of the site).

Beneath the areas of the site near the river, sand and gravel deposits are overlain and/or interbedded with silt- and clay-rich deposits that form a wedge that thickens toward the river. The silt- and clay-rich layer reaches a thickness of over 40 feet beneath portions of the site near the river and is characterized by a vertical permeability on the order of 10^{-7} to 10^{-8} centimeters per second (cm/sec). These low-permeability deposits immediately underlie the CRDA and the CMSD, and provide hydraulic separation between these surface features and the alluvial aquifer.

The primary water-bearing unit in the area is the alluvial aquifer, which occurs within the sand and gravel deposits. This aquifer is currently utilized within the Buck Hill Bottom area, and is producing about 4 million gallons of water daily (mgd). Most of this volume is being pumped from two Ranney wells; one at the Ormet Primary reduction facility and the other at the adjacent Ormet Aluminum Mill Products Corporation rolling mill (former CAC Ranney well). Approximately 1 mgd of the water, all pumped from the rolling mill Ranney well, is used as sanitary and potable water by employees at both the rolling mill and reduction facilities. Approximately 2.5 mgd of water is pumped from the reduction facility Ranney well for use in the aluminum reduction process, primarily as contact and non-contact cooling water. Approximately 0.34 mgd is currently pumped from the interceptor wells (#1 or #2), located about 200 feet to the north-northeast of the reduction facility Ranney well. The transmissivity of the alluvial aquifer has been calculated to range from about 74,608 gallons per day per foot (gpd/ft) to 110,710 gpd/ft, corresponding to a hydraulic conductivity ranging from 8.8×10^{-2} cm/sec to 1.3×10^{-1} cm/sec. The ground water flow velocities beneath the northeast part of the reduction facility are calculated to range from 2,719 feet per year (7.4 feet/day) to 4,017 feet per year (11.0 feet/day).

Ground water flow and water quality data obtained during the RI indicate the presence of a plume in the alluvial aquifer that emanates mainly from the vicinity of the former spent potliner storage area. This plume is characterized by a basic pH, ranging from 8.0 to 10.5, and above background concentrations of total cyanide, fluoride, and sodium. From the area of origin, the plume moves with ground water flow through a section of aquifer about 3,000 feet long toward interceptor wells #1 and #2 and the reduction facility Ranney well. By this flow condition, the plume body exhibits an elongated shape, with highest concentrations in the vicinity of the FSPSA. As the plume is pulled through the aquifer toward the reduction facility Ranney well and interceptor wells, concentrations decrease with distance from the source area.

Hydrology

The adjacent Ohio River is the dominate surface water feature in the site vicinity. The flow and water level of the river are controlled by the U.S. Army Corps of Engineers (ACOE) through the operation of a series of dams constructed along the river. According to the representatives of the Pittsburgh District of the ACOE, the surface of the Ohio River adjacent to the site is predominately maintained at an elevation of 623 feet ± 1-foot by operation of the Hannibal Locks and Dam located approximately 3 miles downstream from the site. However, the river surface does exhibit some fluctuations in response to periodic flooding events. Output from the HEC-2 water surface profile model for this portion of the Ohio River provided by the ACOE indicates that the river elevations associated with the 10-, 50-, and 100-year flood events are 631, 637, and 639.5 feet mean sea level (msl) respectively; and that associated channel and overbank flow velocities are all less than 7 feet per second.

2.2 EXISTING PLUME COLLECTION AND TREATMENT SYSTEM

The plume collection system at the site consists of continuously pumping one of the two existing interceptor wells that are located approximately 200 feet north of the reduction facility Ranney well. These wells, referred to in the RI Report as the "Old Interceptor Wells," have been operated since about 1973, and are positioned to intercept the ground water plume before it reaches the reduction facility Ranney well. The interceptor wells are pumped at an average rate from about 200 to 250 gallons per minute (gpm).

The existing interceptor wells are positioned near the center of the cone of influence created by the reduction facility Ranney well. By their positioning, the existing interceptor wells utilize the hydraulic influence of the Ranney well which, pumping at rates from about 1,600 to 1,800 gpm, exerts site-wide control over the flow of ground water within the alluvial aquifer. Pumping of the existing interceptor wells serves to intercept the ground water plume as it is pulled toward the Ranney well, thus protecting the quality of ground water produced by the Ranney well.

Based on the past 20 years of performance, the existing interceptor well system has required low maintenance, with little down time for servicing. During periods when one of the two interceptors wells is being serviced, the other is pumped. Based on the past 20 years of monitoring, the existing interceptor wells, operating in conjunction with the reduction facility Ranney well, effectively contain the ground water plume in the alluvial aquifer beneath the site.

The effectiveness of pumping the existing interceptor wells to restore aquifer quality reflects their ability to deplete the mass of contaminant in the ground water, and the extent to which they facilitate flushing of the saturated aquifer matrix. As described earlier, the existing interceptor wells are positioned near the center of the site-wide cone of influence established by the reduction facility Ranney well. Pumping of the reduction facility Ranney well establishes the hydraulic gradient that causes continuous flushing of the affected portions of the saturated aquifer matrix, and the existing interceptor wells remove the mass of the contaminant plume prior to its reaching the Ranney well. By this relationship, operation of the existing interceptor wells, in conjunction with pumping of the reduction facility Ranney well, achieves a high degree of flushing of affected portions of the saturated aquifer matrix. Pumping of the Ranney well flushes water beneath the entire area of contamination on a continuous basis (virtually 24 hours per day, 365 days per year). Also, because the pumping centers are located about 2,800 feet from the source of the plume, drawdown within the most affected portions of the aquifer matrix is minimized and the saturated aquifer thickness subjected to flushing is maximized.

Operation of the existing ground water collection and treatment system has resulted in significant reductions in ground water constituent concentrations and a high degree of removal of mass from the contaminant plume. The area of the plume characterized by elevated pH levels and concentrations of total cyanide, fluoride, and sodium concentrations in 1995 is significantly reduced relative to 1984 (when the earliest round of comparable data was collected). In addition, water quality data collected from the existing interceptor wells since 1987 indicate that the total cyanide mass has decreased over time, at a rate of about 13 percent per year. This trend is attributed to depletion of total cyanide in the alluvial aquifer system. Ultimately, the total cyanide concentrations will level off at some relatively low value. If one assumes that this leveling will occur at a total cyanide concentration below 0.1 mg/L (a level substantially below the Maximum Contaminant Level, MCL), the time to theoretically achieve a concentration of 0.1 mg/L in the ground water produced at the existing interceptor well system was projected in the Feasibility Study Report to be about 25 years.

Ground water produced by the existing interceptor wells is treated at the Ormet Primary ground water treatment plant which has been in operation since June 1994. This state-of-the-art facility represents the Best Available Technology (BAT) for treatment of water from the plume, and utilizes chemical precipitation/coagulation by the addition of lime and ferrous iron salt prior to discharge under the NPDES program.

2.3 FORMER SPENT POTLINER STORAGE AREA

The Former Spent Potliner Storage Area (FSPSA) is located in the northeast portion of the Ormet Primary site, between the site access road and former Disposal Pond 5. The topography of the FSPSA is predominantly gently sloping toward the south, as shown on Figure 3. In the vicinity of the FSPSA, current ground surface elevations vary from a low of approximately 650 feet (to the south) to a high of approximately 665 feet along the northern boundary. Comparison of the current and pre-development ground surface elevations on this portion of the site suggests that a significant thickness (on the order of 10 to 40 feet) of the former surficial soil in this area was removed during the initial plant development activities.

During the period of 1958 to 1981, spent potliner was stored in two separate piles located north and south of an unpaved access road. Approximately 85,000 tons of potliner were placed in the area for storage between 1958 and 1968. During 1968 to 1981, Ormet Primary used an on-site cryolite-recovery plant to process spent potliner that was being generated by manufacturing operations. During 1968 to 1981, Ormet Primary used construction equipment to load spent potliner from the FSPSA into trucks for transport to the cryolite-recovery plant. While spent potliner in the FSPSA was removed, a small portion of the spent potliner material was broken and crushed during handling by construction equipment and has been mixed into the underlying soil. As previously discussed, shallow soil within the FSPSA is the predominant source of ground water alterations in the alluvial aquifer.

Based upon information developed during the Remedial Investigation, the generalized stratigraphy beneath the FSPSA consists of three general strata; fill material, which is underlain by sand and gravel, which is underlain by bedrock. The fill layer is present at the ground surface over much of the area, and ranges in thickness up to 4 feet. The thickness of the underlying sand and gravel stratum ranges from approximately 30 feet at the northern edge of the FSPSA to approximately 60 feet at the southern edge. In addition, there are interbedded layers of clay and silt present within the stratum, predominantly beneath the northern portion of the FSPSA. The underlying bedrock is a silty shale to mudstone and is encountered at depths ranging from approximately 35 feet at the northern edge of the FSPSA to approximately 70 feet at the southern edge.

As previously discussed, the sand and gravel stratum forms the matrix of a relatively transmissive aquifer. The depth to ground water beneath the FSPSA ranges from approximately 15 feet along the northern edge of the FSPSA to approximately 35 feet throughout the remainder of the area. It is believed that the historical ground water flow direction was from northwest to southeast, towards the Ohio River. Current ground water flow is influenced by pumping from the reduction facility Ranney well and two interceptor wells, which cause the ground water flow to be generally to the southwest. Based on aquifer testing conducted at Interceptor Well #3 and monitoring well MW-17 located at the south end of the FSPSA, the transmissivity of the sand and gravel aquifer is estimated to be on the order of 75,000 to 110,000 gpd/ft. However, the transmissivity of the sand and gravel aquifer is probably lower at the north end of the FSPSA due to the decrease in saturated thickness and the increased presence of fine-grained materials. The hydraulic conductivity of sand and gravel in the vicinity of Interceptor Well #3 and monitoring well MW-17 was estimated to be on the order of 8.8×10^{-2} to 1.2×10^{-1} cm/sec. It should be noted that these values reflect the horizontal hydraulic conductivity of the sand and gravel, and that vertical hydraulic conductivities may be significantly lower, especially in localized areas.

Information on the infiltration rates for soil in the FSPSA was not collected during the Remedial Investigation. However, based upon the granular nature of the surficial soil in this portion of the site, Dames & Moore estimates that approximately 25 percent of the annual precipitation will infiltrate through the surface soil and into the ground water system at the site. This equates to approximately 10 inches of infiltration per year. The remainder of the annual precipitation is lost to evapotranspiration and surface runoff to areas southwest of the FSPSA. Assuming an effective soil porosity of 20 percent, it is estimated that the upper two feet of the FSPSA (the portion with the highest contaminant concentrations) is flushed once every seven months, or 1.7 times per year, by the natural precipitation/infiltration cycle.

2.4 CARBON RUNOFF AND DEPOSITION AREA

The CRDA is a wooded area of the plant site bordered on the west by the toe of the slope below the plant fence line between wells MW-3 and MW-40, on the east by the toe of the CMSD, on the north by the fence line south of Ponds 1 and 2, and the south by the Ohio River. Surface features in the vicinity of the CRDA are depicted in Figure 4. The deposits of carbon material in this area range from less than 1-foot to approximately 5 feet thick and appear to have been carried into this area by stormwater runoff from the area around the anode crushing mill.

2.5 BACKWATER AREA

The Backwater Area is located at the mouth of the 004 Outfall stream and is bounded to the west by the CRDA, the east by the CMSD, and south by the Ohio River. Surface features in the vicinity of the Backwater Area are depicted in Figure 4. The Backwater Area has received stormwater runoff from areas of the plant, the CRDA, the CMSD; and wastewater discharges from Outfall 004. These processes have resulted in the accumulation of sediment within that area that exhibit detectable levels of PCBs and polynuclear aromatic hydrocarbons (PAHs). With the Backwater Area located adjacent the Ohio River, the sediments are typically saturated and/or submerged.

2.6 CONSTRUCTION MATERIAL SCRAP DUMP (CMSD)

The CMSD covers an area of approximately 4 to 5 acres on the southeastern portion of the Ormet Primary property. The CMSD occupies an area that was formerly a terrace above the Ohio River floodplain. Based upon historic topographic information developed prior to construction in this area, the ground surface beneath the CMSD was typically flat to gently sloping, with a pair of drainage channels trending parallel to the Ohio River that discharged into what is now referred to as the Backwater Area. Historic ground surface elevations beneath the CMSD predominantly ranged from approximately 627 to 632 feet. Immediately southeast of the CMSD, the ground sloped steeply to the former Ohio River floodplain, located at elevations ranging from 602 feet (the former Ohio River pool elevation) to 610 feet.

The CMSD operated from approximately 1959 through 1979. During that time, the unit received a variety of material and debris from plant operations. As discussed in the Remedial Investigation, materials that were potentially (but not necessarily) disposed include furnace brick, wooden pallets, petroleum coke fines and anode production scrap, miscellaneous demolition debris, petroleum products, plant trash, discarded electrical components, motor shop wastes, discarded mechanical components, discarded raw materials (e.g., alumina, cryolite, and anode binder pitch), and spent potliner. The materials were typically transported by truck, then dumped and spread over the ground surface. Throughout the period that the CMSD operated, an independent salvage contractor operated at the site to recover recyclable and/or reusable items.

More recent topography (data collected in April 20, 1987) depicting the surface of the CMSD and adjacent areas approximately 8 years following the last use of the CMSD is presented in Figure 4. Areas located above elevation 660 feet are typically vegetated, with slopes of 5 percent or less. Those below elevation 645 feet to the west, and 600 to the southeast along the river, are predominately wooded and steeply sloped, with grades on the order of 1.5 feet (horizontal) to 1-foot (vertical) or greater. Completion of the Hannibal Locks and Dam in 1975, raised the pool elevation of the Ohio River to 623 feet. As a result, the shoreline of the river moved approximately 50 to 100 feet northwest.

During the Remedial Investigation, samples were collected from five seeps located along the western limit of the CMSD. The discharge from these seeps flows into the Outfall 004 stream and subsequently to the Backwater Area. The seeps are believed to result from precipitation that has infiltrated through the CMSD, and migrated along the surface of the low permeability strata that existed on the upper floodplain prior to construction of the CMSD. This interpretation is supported by results of testing performed during the Remedial Investigation that indicate that representative samples of this strata exhibit vertical permeabilities predominantly ranging from 1×10^{-7} to 1×10^{-8} cm/sec, which is consistent with current performance requirements for the construction of low permeability soil liner system components for solid and hazardous waste landfills. Excess water that may contact the underlying clay stratum will preferentially migrate along the historic ground surface and discharge to the west. Thus, the natural soil and historic land surface topography act in conjunction to serve as a functional leachate collection system for the CMSD.

3.0 REMEDIAL DESIGN OBJECTIVES AND SCOPE OF WORK

The remedial design objectives for the site, as stated in the Record of Decision Declaration, are "to eliminate or reduce contamination in soils, sediments and ground water, and to reduce the risks associated with exposure to contaminated materials." The specific environmental risk considerations that formed the basis for the U.S. EPA's selection of the remedial action components are described in the Protection of Human Health and the Environment Subsection of the Record of Decision. These considerations are to:

- Remove the threat of direct contact to humans and the ecological threat to fish and other organisms by excavating contaminated sediment existing within the Backwater Area.
- Remove the threat of continued migration of hazardous substances and/or other contaminants from the CRDA into the Backwater Area by removing accumulated carbon material.
- Remove the threat of continued migration of hazardous substances and/or other contaminants from the CMSD seeps into the Backwater Area and reduce the risk of exposure to hazardous substances present in the seeps by installing trench drains and collecting the seep water.
- Reduce the risk of exposure to hazardous substances present in the soil and sediment at the site, by placing the removed soil and sediment within the CMSD, and installing a landfill cap.
- Remove the risk that hazardous substances, pollutants, and/or contaminants that may exist within the CMSD will migrate into the Backwater Area and contaminate clean sediment by installing a landfill cover over the CMSD to reduce the rate of infiltration through the soil, sediment, and CMSD materials, and thus the potential for leachate generation.
- Reduce the assumed future risk to site workers from the ingestion of contaminated ground water, by extracting and treating the contaminated ground water.

- Reduce the length of time needed to clean up the FSPSA as a source of contamination to ground water (and thus reduce the assumed future risk to site workers) by implementing soil flushing within the FSPSA.
- Prevent exposure to hazardous substances and contaminants in the soil and ground water through the imposition of institutional controls.

In addition, the ROD indicates that the ground water remedial action shall maintain a capture zone to prevent constituents from migrating in the subsurface to the Ohio River.

To achieve these objectives, the remedial alternative selected for the Ormet Primary Superfund Site (as described in the Consent Decree, Record of Decision, and Statement of Work) includes the following components:

- Impose Institutional Controls
- Continue Ground Water Restoration
- Perform Soil Flushing on FSPSA Subsoil
- Recontour and Cover the CMSD
- Collect and Treat CMSD Seeps
- Remove Contaminated Material from CRDA
- Remove Contaminated Sediment from Backwater Area

The approach for implementing these components is discussed in the applicable sections of the work plan that follow. Specific deliverables that will be submitted during the Remedial Design program include:

- Preliminary Design Submittal, including reports on Pre-Design Investigations
    - CMSD/Outfall 004 Area Investigation Report
    - Backwater Area Sediment Investigation Report
    - Background Ground Water Constituent Analysis
    - Ground Water Plume Constituent Mass-in-Place Estimate
    - FSPSA Soil Treatability Study Report
    - CMSD Seep Treatability Study Report
- Intermediate Design Submittal
- Pre-Final/Final Design Submittals

4.0 REMEDIAL DESIGN ACTIVITIES

Remedial Design activities will be implemented to establish the specific Remedial Action requirements. This will be accomplished through the performance of pre-design studies; preparation of construction drawings and specifications, including supporting engineering calculations; preparation of supporting plans and documents; and establishment of post-construction operations and maintenance activities. These activities are intended to support and document the remedial design's ability to achieve the Applicable or Relevant and Appropriate Requirements (ARARs) as presented in the Feasibility Study and Record of Decision.

The schedule for implementation and completion of various Remedial Design and Remedial Action milestones is presented in Figure 5. The anticipated schedule for implementation of the pre-design activities is presented in Table 2.

4.1 REMEDIAL ACTION TASKS

A summary of the tasks comprising the selected alternative, and discussions of the associated work products to be addressed during remedial design, are presented below.

4.1.1 Task 1 - Impose Institutional Controls

The Record of Decision requires the Settling Parties to impose access restrictions to restrict access to the site, and deed restrictions to prevent residential development and prohibit the installation of drinking water wells on affected portions of the property.

The access restrictions will involve the installation of a fence, or fences, encompassing all source and/or disposal areas within the surveyed boundary of the site as delineated in Appendix C to the Consent Decree. The fence will be installed as part of remedial construction activities, and will consist of a 6-foot high, chain-link fence, topped with three strands of barbed wire. Access to the site will be provided through gates, which will be kept locked, except as needed for authorized ingress or egress. Warning signs will be posted at the gates and at approximately 200-foot intervals along the fence. The signs will clearly advise of danger and will provide a warning against trespassing. The signs will also provide a telephone number to call for further information.

Specific requirements for the deed restrictions are included in Appendix D of the Consent Decree. As required by the Statement of Work, Ormet Primary will file the deed restrictions required under the Consent Decree.

4.1.2 Task 2 - Continue Ground Water Restoration

The Record of Decision requires Ormet Primary to mitigate identified ground water alterations through continued operation of the existing collection and treatment systems. Ground water will continue to be extracted using the existing interceptor wells, and plume containment shall be provided through continued operation of the Ormet Primary Ranney Well. The specific steps include:

- Extract contaminated ground water using the two existing interceptor wells, and ensure plume containment by operation of the Ormet Primary Ranney well.
- Treat water from the extraction wells by precipitation with lime and ferrous salts, followed by gravity clarification.
- Discharge treated ground water to the Ohio River in compliance with Ormet Primary's NPDES Permit.
- Properly dispose of treatment residuals, such as filter cake from the dewatering clarifier sludge, off-site in a RCRA permitted Landfill.

Within four months following completion of Remedial Construction activities, ground water quality monitoring will be initiated. The approved monitoring system (to be defined) shall be monitored at an initial frequency of 3 times per year, subject to revision based upon information collected during operation of the system over the course of the remedy. Ormet Primary will monitor the performance of the treatment system on an annual basis. The specific monitoring and evaluation protocols will be established during the Remedial Design, as part of the Operation and Maintenance Plan development activities.

Ground water restoration activities will continue until the performance standards listed in Table 1 are met throughout the plume and at the downgradient points of compliance. ~~, or U.S. EPA approves a petition from Ormet Primary to terminate the ground water restoration activities.~~

4.1.3 Task 3 - Perform Soil Flushing on FSPSA Subsoil

To reduce the amount of time that is needed to restore portions of the alluvial aquifer impacted by infiltration from the FSPSA, in-situ soil flushing will be performed. The flushing will be provided by an enhanced infiltration system constructed over the site.

The enhanced infiltration system will consist of a water distribution system connected to a series of sprinkler heads. The sprinkler heads and distribution lines will be buried to maintain a low profile and not limit surface access for maintenance of the area. To facilitate the flushing activities, the ground surface within the treatment area will be regraded to minimize the potential for runoff of precipitation and the flushing media. A thin vegetative soil cover will then be placed over the area to serve as a barrier to prevent personnel contact with FSPSA soil, and enhance infiltration of the flushing media. It is anticipated that the soil flushing system will be operated for approximately 9 months each year using water from the reduction facility Ranney well. The rate of water application will be adjusted, as needed, to maintain hydraulic control of the ground water beneath the FSPSA, not overburden the existing extraction well or ground water treatment plant, and maximize the amount of water applied to the FSPSA. Construction drawings and specifications will be prepared to describe the soil flushing system installation and equipment requirements, including relevant construction quality assurance/quality control measures.

To design the system, the area to be treated will be defined through review of the soil sampling results from the RI, RI ground water monitoring results, available aerial photographs, and observations of stressed vegetation. During implementation of soil flushing, ground water constituent concentrations identified as part of the ground water monitoring program will be reviewed to assess the effectiveness of flushing. A bench-scale treatability study will also be performed on soil from the FSPSA to estimate soil constituent levels hypothetically needed to achieve Ground Water Cleanup Standards. The results of this testing will be used to establish Soil Cleanup Standards for the constituents listed in Table 1. When it appears that Ground Water Cleanup Standards have been achieved, soil sampling and analysis will be performed to identify residual constituent concentrations in the FSPSA subsoil, and permit comparison to the Soil Cleanup Standards.

Following system start-up, Ormet Primary will monitor the hydraulic containment of the existing extraction wells and the Ranney well as discussed in the SOW. Also, as described in the Statement of Work, treatment of the FSPSA soils may cease under two different scenarios:

1. When Soil Cleanup Standards are achieved and when all ground water compliance points in and downgradient of the FSPSA achieve Ground Water Cleanup Standards for three consecutive monitoring events, or

2. If Ground Water Cleanup Standards have been achieved in downgradient monitoring wells for three consecutive monitoring events, but Soil Cleanup Standards have not been achieved, Settling Defendant may petition U.S. EPA to terminate soil flushing in the FSPSA.

4.1.4 Task 4 - Remove Contaminated Material From CRDA

The Record of Decision requires that material within the CRDA be excavated down to native soil, and, if appropriate (i.e., they exhibit a PCB concentration of 50 mg/kg or less), be consolidated within the CMSD prior to installation of the CMSD cap. Prior to excavation, trees and brush growing in the area will be cleared to approximately ground level, without grubbing, and transported out of the area. The remaining portions of the vegetation, primarily the root zone, will be managed as contaminated material unless otherwise approved by the U.S. EPA. The excavation activities will continue until the underlying soil is shown to meet the Soil Cleanup Standards presented in Table 1. The excavated materials will be temporarily staged in piles of up to 30 cubic yards, located either within the limits of the CRDA or CMSD, and a representative composite sample will be collected from each pile and analyzed for PCBs. The staged piles will be protected with plastic sheeting (or other appropriate materials) to prevent contact with precipitation. Stockpiles determined to have a PCB concentration less than 50 parts per million (ppm) will be consolidated within the CMSD prior to construction of the CMSD cap. Stockpiles determined to have a PCB concentration greater than 50 parts per million (ppm) will be loaded for off-site transportation and disposal at a Toxic Substances Control Act (TSCA) disposal facility.

Upon completion of the excavation activities, the area will be regraded and revegetated. In the event that additional fill materials are needed, only clean soil fill will be used as backfill. Controls will also be established to prevent continued run-off from the plant area to the CRDA. The Record of Decision also requires that the 004 Outfall be re-routed to discharge directly to the Ohio River.

A pre-design investigation will be performed to further define the approximate horizontal limits of soil removal between the 004 Outfall Stream and the regraded CMSD limit. Construction drawings and specifications will be prepared to describe the soil excavation, transportation, and placement requirements, including relevant construction quality assurance/quality control measures.

As indicated in the SOW, Ormet Primary may petition U.S. EPA to approve an alternate PCB Cleanup Standard for the CRDA. A work plan describing the possible petition is presented in Appendix H.

4.1.5 Task 5 - Remove Contaminated Sediment From Backwater Area

The Record of Decision requires that contaminated sediment within the backwater area be dredged and, if appropriate (i.e., they exhibit a PCB concentration less than 50 mg/kg), be consolidated within the CMSD prior to installation of the CMSD cap. Prior to excavation, the Backwater Area will be isolated from the Ohio River by construction of a sheet-pile wall, or other appropriate barrier. Process and stormwater flows from the 004 Outfall will be diverted to minimize the potential for ponding behind the barrier. The sediment removal activities will be performed using either wet or dry dredging methods. If wet dredging methods are used, the sediments that exhibit constituent concentrations above the Sediment Cleanup Standards established in Table 1 will be removed and placed upon a nearby staging pad, which will be constructed to drain excess water back into the Backwater Area. If dry dredging methods are used, a series of sumps and/or wellpoints will be installed to remove ponded water and reduce the amount of free water contacting the sediment.

Accumulated sediments that exhibit constituent concentrations above the Sediment Cleanup Standards established in Table 1 will then be excavated (by front-end loader, backhoe, or similar equipment) and staged in piles of up to 30 cubic yards located either within the limits of the Backwater Area, CRDA or CMSD. If necessary, fly ash, quick lime, or other pozzolanic material will be added to the sediment to eliminate free liquids and/or improve the materials shear strength for excavation, transportation, or staging activities. Prior to stabilization, a representative composite sample will be collected and analyzed from each stockpile for PCB content. While the materials are being staged, the surfaces will be protected with plastic sheeting (or other appropriate materials) to prevent contact with precipitation.

Stockpiles determined to have a PCB concentration less than 50 parts per million (ppm) will be consolidated within the CMSD prior to construction of the CMSD cap. Stockpiles determined to have a PCB concentration greater than 50 parts per million (ppm) will be loaded for off-site transportation and disposal at a TSCA disposal facility.

Upon completion of the dredging activities the area will be regraded, and areas above the river pool elevation will be revegetated. In the event that additional fill materials are needed, only clean soil fill will be used as backfill.

A pre-design investigation will be performed to define the approximate horizontal and vertical limits of sediment removal in the Backwater Area. Construction drawings and specifications will be prepared to describe the sediment excavation, transportation, and placement requirements, including relevant construction quality assurance/quality control observation and testing.

4.1.6 Task 6 - Recontour and Cover the CMSD

The Record of Decision requires Ormet Primary to recontour and cap the CMSD with a cap that meets the substantive requirements of RCRA Subtitle C landfill closure. Prior to construction of the cover system, the CMSD area will be regraded to eliminate the steep slope adjacent to the Ohio River. The CMSD will be regraded to a maximum slope of 25 percent (4 horizontal to 1 vertical). The regraded material will be placed in the small valley in the western portion of the CMSD as shown on Figure 6. Material removed from other portions of the site (e.g., material from the Backwater Area, CRDA, etc.) deemed suitable for consolidation will also be placed in this area. During regrading activities, the steel conduit pipe previously observed north of the CMSD will be removed (if still present). Following regrading, material transfer, and pipe removal activities, a subgrade layer will be placed and compacted to provide support for the cover construction activities.

The cap will be designed in general accordance with applicable provisions of *Design and Construction of RCRA/CERCLA Final Covers* (U.S. EPA, 1991) and *Requirements for Hazardous Waste Landfill Design, Construction, and Closure* (U.S.

EPA, 1989) with the exception that maximum cover slopes will approach 25 percent (rather than the recommended 5 percent), unless Ormet Primary demonstrates that construction of such a cover system over the steep slopes adjacent to the Ohio River is technically impracticable from an engineering perspective. Unless Ormet Primary petitions for a waiver of these requirements, the cap will consist of the following components:

- A vegetative soil layer of sufficient thickness that the low permeability barrier component is located below the frost line.
- A 6-inch sand drainage layer, or synthetic equivalent.
- A 40-mil synthetic (e.g., HDPE, LLDPE, VLDPE, etc.) low permeability liner.
- A 2-foot-thick, low-permeability clay layer, or synthetic equivalent.
- Soil, as needed, to achieve slope requirements or provide a suitable subgrade for synthetic barrier components.
- Controls, as needed, to prevent erosion in the event of a 100-year flood.

The CMSD cover design activities will address the anchor detail along the river, erosion controls for the cover system, and slope protection, as needed, for portions of the CMSD cover below the 100-year flood elevation. Construction drawings and specifications will be prepared to describe the material regrading and cap construction activities, including relevant construction quality assurance/quality control measures.

4.1.7 Task 7 - Collect and Treat CMSD Seeps

The Record of Decision requires that the identified CMSD seeps be remediated by the construction of seepage collection systems. The systems will consist of gravel-filled trenches, or similar performing technologies, that will direct the water to one or more collection sumps. Clean-outs will be located at appropriate points in the system to permit maintenance of the system, if necessary. Any soil excavated to install the system will be evaluated for PCB content and, if determined suitable for consolidation, be placed within the CMSD in accordance with the procedures for contaminated soil removed from the CRDA.

Water that collects in the sumps will be pumped to a pre-treatment system (likely consisting of an oil separation stage followed by an activated carbon adsorption stage) prior to discharge to the Ohio River or existing ground water treatment plant in accordance with applicable NPDES requirements. Residuals from the pre-treatment systems (i.e., spent carbon, oil, sediment from the oil/water separator, etc.) will be characterized and disposed in accordance with applicable laws and regulations.

A pre-design treatability study will be performed to evaluate the ability of an oil removal and carbon adsorption system to achieve NPDES effluent limitations. Construction drawings and specifications will be prepared to describe the system installation and equipment requirements, including relevant construction quality assurance/quality control measures.

4.2 PRE-DESIGN ACTIVITIES

Pre-design activities will be performed to collect data necessary to finalize the basis for design. This will include completion of bench-scale treatability studies and limited soil/sediment investigations. A work plan has been developed for each of the proposed investigations. The plans present detailed procedures for performing the investigations and quality control/quality assurance measures, where appropriate. A Pre-Design Health and Safety Plan has been developed for use during implementation of the site investigations. The Health and Safety Plan describes minimum health, safety, and emergency response requirements in accordance with U.S. EPA and Occupational Safety and Health Administration (OSHA) guidelines. In addition, a Pre-Design Sampling and Analysis Plan (SAP), and site-specific Quality Assurance Project Plan, have been prepared to identify quality control and quality assurance procedures applicable to pre-design sample collection and testing activities. A pre-design Data Management Plan has also been prepared to address project management systems, including data requirements and back-up data management. The specific investigation plans and data management plan are presented as appendices to this Work Plan. The Pre-Design Health and Safety Plan and Pre-Design SAP are presented as companion documents to the Work Plan. Information regarding the pre-design investigations is summarized in the sections that follow. The anticipated schedule for implementation of the pre-design activities is presented in Table 2.

4.2.1 CMSD / Outfall 004 Area Soil Investigation

A limited investigation will be performed to assess the extent of possible PCBs in surficial soil located between the 004 Outfall Stream and the proposed limit of the CMSD. The investigation will involve the collection of soil samples from eight locations to establish the approximate lateral extent of soil remediation. Grab samples will be collected from depth intervals of 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches, and sent to the laboratory for extraction and storage. Samples will be analyzed in sequential fashion, in descending order, to identify the approximate extent of soil exceeding the Soil Cleanup Standards presented in Table 1.

The results of the investigation will be included with the Preliminary Design Submittal. A detailed work plan describing the soil investigation activities is presented in Appendix A.

4.2.2 Backwater Area Sediment Investigation

A limited investigation will be performed to assess the distribution of possible PCBs in the Backwater Area sediment. The investigation program will involve the collection of sediment samples from four locations to establish the approximate lateral extent of remediation and permit approximation of the volume of sediment that will be dredged and possibly consolidated under the CMSD cap. The investigation will involve the collection of grab samples by personnel in waders, or from a rowboat, or similar craft. Grab samples will be collected from depth intervals of 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches and sent to the laboratory for extraction and storage. Samples will be analyzed in sequential fashion, in descending order, to identify the approximate extent of soil exceeding the Sediment Cleanup Standards presented in Table 1.

The results of the investigation will be included with the Preliminary Design Submittal. A detailed work plan describing the sediment investigation activities is presented in Appendix B.

4.2.3 Background Manganese and Arsenic Level Assessment

Statistical analysis of background manganese levels in ground water will be performed to establish the cleanup standard for the ground water remediation activities. In addition, statistical analysis of background arsenic levels in ground water may be performed to evaluate the appropriateness of the current cleanup standard for the ground water remediation activities.

The statistical analyses will be performed using historical ground water data for wells not affected by the identified ground water plume (i.e., MW-1, 4, 7, 12, 19, 20, 23s, 23d, 33s, 33d, 38, 41, 43s, and 43d). The background levels will be determined by constructing a one-sided upper tolerance interval.

The statistical analyses and results will be included with the Preliminary Design Submittal. A detailed work plan describing the approach for determining background concentrations of manganese and arsenic in ground water is presented in Appendix C.

4.2.4 Ground Water Constituent Mass-in-Place Estimate

To assist with future evaluations of the effectiveness of ground water restoration activities, an estimate will be made of the current contaminant mass within the plume. Ormet Primary will utilize the most recently available ground water data to estimate the dissolved contaminant plume mass-in-place.

The estimates will be made utilizing the most recently available site-wide ground water monitoring data, collected in January 1995. The estimates will be developed by multiplying the volume of the affected portions of the aquifer by representative constituent concentrations, and summing the products until the entire volume of the plume is considered.

The estimate results will be included with the Preliminary Design Submittal. A detailed work plan describing the process for estimating ground water contaminant mass-in-place is presented in Appendix D.

4.2.5 FSPSA Soil Treatability Study

A bench scale treatability study will be performed to support design of the soil flushing system and to estimate soil constituent levels hypothetically needed to achieve Ground Water Cleanup Standards. The results of this testing will be used to establish FSPSA Soil Cleanup Standards for the inorganic constituents listed in Table 1.

The treatability study will be bench scale, (i.e., performed in a laboratory), performed using soil samples collected from within the FSPSA and using water from the Ormet Primary Ranney system as the soil flushing agent. The study will involve the collection and testing of an approximately 5-gallon composite soil sample collected from the uppermost 1 to 2 feet of fill material and underlying natural soil at three locations in the FSPSA. Because of the heterogeneous constituent distributions of cyanide, fluoride, and sodium (the three primary inorganic constituents of concern) identified in the RI, composite sample aliquots will be collected from the three areas that yielded elevated levels of the primary constituents of concern. The collected samples will be homogenized and a representative portion will be analyzed for the inorganic constituents listed in Table 1. A representative sample of water will also be collected from the Ormet Primary Ranney well and analyzed for the specified inorganic parameters, as well as pH, that will influence the solubility of inorganic compounds.

The bench-scale flushing simulation will be performed in a two-phased approach. For the first phase, the sample will be analyzed to evaluate the approximate number of pore volumes that must be flushed through the sample to achieve the established Ground Water Cleanup Standards for each parameter. The flushing simulation will involve placing a controlled weight of sample in Pyrex Buchner funnels. Separate aliquots of water will be leached by gravity through the soil column (soil in the Buchner funnel). The excess water ("leachate") that drains through the soil from each aliquot application will be collected, and a representative sample analyzed for pH. Water that drains from the first, third, and fifth aliquot applications, will be submitted to the analytical laboratory for determination of the constituents of concern. The results will be compared to the established Ground Water Cleanup Standards. If all constituent concentration are below the cleanup standards, the initial phase will be considered complete. If any constituent concentrations exceeds its approved cleanup standards, additional aliquots of water will be added to the soil and the resulting leachate periodically analyzed until such time that all constituent concentrations are below the cleanup standards. Upon completion of the leaching, the soil will be removed and reanalyzed for the constituents of concern.

For the second phase of the study, portions of the sample will be analyzed to determine the various soil constituent levels corresponding to achievement of the various Ground Water Cleanup Standards. The flushing simulation will be performed in a similar manner to that performed during the first stage, except that a series of up to eight samples (depending upon the approximate number of flushes needed to achieve the cleanup standards for the various constituents) will be prepared for analysis. Aliquots of water will be added to each sample corresponding to the estimated number of flushes required to achieve the approved cleanup standard for a particular constituent. At that time, the leachate corresponding to the last flush and the soil from the column will be submitted for analysis of the constituents of concern. These results will be evaluated to determine the approximate total constituent level that will not leach above the approved Ground Water Cleanup Standards.

The results of the treatability study will be included in the Preliminary Design Submittal. A detailed work plan describing the FSPSA soil flushing treatability study activities is presented in Appendix E.

4.2.6 CMSD Seep Treatability Study

A bench scale treatability study will be performed to evaluate whether or not the CMSD seeps exceed applicable NPDES constituent limits, and to evaluate whether pre-treatment through oil/water separation and activated carbon adsorption will reduce the concentrations to achieve the limits.

The study will be performed in two phases. The first phase will involve collection of water from Seeps 2 and 3 (the seeps exhibiting the highest PCB levels during the RI), and development of a composite sample for subsequent analysis. The composite will be analyzed for oil and grease, PCBs, and relevant inorganic parameters. An initial sample (composite) size of 7 liters is desired.

Bench scale testing will be determined based on screening analysis using the following adsorbents or equivalent products: Calgon KLENSORB 100, Calgon FILTRASORB 400, and Calgon DSR-C 8x30. From the composite sample, six one liter samples will be placed in amber glass jars for bench scale testing. Dosing rates will be determined by comparing the initial analytical results to loading rates recommended by the manufacturer for each product. Sample loading rates will be determined based upon the baseline analytical results and manufacturers recommended loading rates for the specific product.

PYREX/KIMAX Buchner funnels will be used as the dosing columns for the adsorbent. The size of the Buchner funnel will be sized according to the maximum recommended amount of adsorbent that will be required to treat up to at least one liter of sample, depending upon the typical concentration of oil and grease detected in the baseline analytical results.

The following bench scale tests will be performed contingent upon the suspected presence of free oil which could coat and blind granular activated carbon. Following each test, the filtrate will be tested for oil and grease.

- One sample will be tested by passing the sample through KLENSORB 100
- One sample will be tested by passing the sample through FILTRASORB 400 virgin liquid phase activated carbon (GAC)
- One sample will be tested by passing the sample through DSR-C 8X30 reactivated GAC
- One sample will be tested by passing the sample though virgin GAC and then filtered through the KLENSORB 100
- One sample will be tested by passing the sample through reactivated GAC and *then filtered through* KLENSORB 100.

The results of the treatability study will be included with the Preliminary Design Submittal. A detailed work plan describing the CMSD Seep Treatability Study is presented in Appendix F.

4.3 PRELIMINARY DESIGN

The preliminary design will represent the completion of approximately 30 percent of the design effort, and involve the preparation of preliminary construction drawings and a preliminary design report. The preliminary design report will describe the results of pre-design activities and preliminary design calculations. It will also present the design basis to be used for the intermediate and final design stages. A list of the drawings anticipated to be included with the Preliminary Design is presented in Table 2. In addition, the submittal will include or discuss:

- Preliminary Design plans, drawings, and sketches, including design calculations
- Data and discussions presenting the results of Pre-Design Investigations and Treatability Studies
- Design assumptions and parameters, including identified design restrictions, process criteria, process and instrumentation diagrams and descriptions, and anticipated removal and/or treatment efficiencies
- Proposed cleanup verifications methods, including comparisons to ARARs

- Outlines of the design specifications
- Proposed locations of process equipment and construction activities
- Anticipated long-term monitoring and operation requirements
- Real estate, easement, and permit requirements, if any
- Preliminary construction schedule, including proposed contracting strategy

The preliminary design will be submitted to the U.S. EPA for review and comment within 120 days following U.S. EPA approval of the Work Plan.

4.4 INTERMEDIATE DESIGN

Intermediate design activities will be initiated after receipt of U.S. EPA's comments on the preliminary design. The intermediate design is intended to represent completion of approximately 60 percent of the design effort. This will involve making required revisions based on the U.S. EPA comments, increasing the level of detail (including the number of drawings), and preparing a set of draft construction specifications. It is anticipated that the intermediate design will include the drawing set presented in Table 3.

In addition to the items included in the Preliminary Design, the Intermediate Design Submittal will include:

- Draft Performance Standard Verification Plan.
- Draft Construction Quality Assurance Plan.
- Draft Construction Health & Safety/Contingency Plan.
- Draft Field Sampling Plan, including proposed changes to the site-specific Quality Assurance Project Plan (if needed).

The Intermediate Design will be submitted to the U.S. EPA for review and comment within 60 days following receipt of U.S. EPA comments on the Preliminary Design Submittal.

4.5 PRE-FINAL/FINAL DESIGN

Final Design activities will be initiated after receipt of U.S. EPA's comments on the Intermediate Design. The final design will consist of two phases; a Pre-Final Design, and a Final Design.

The Pre-Final Design is intended to represent substantial completion (90 percent) of the remedial design. The Pre-Final Design will include all items submitted with the intermediate design, incorporating modifications and/or additions to reflect appropriate comments and increased detail. In addition to the items included in the Intermediate Design, the Pre-Final Design Submittal will include:

- Proposed Final Performance Standard Verification Plan.
- Proposed Final Construction Quality Assurance Plan.
- Proposed Final Construction Health & Safety/Contingency Plan.
- Proposed Final Field Sampling Plan.
- Draft Operation and Maintenance Plan.
- Capital and Operation and Maintenance Cost Estimate.
- Remedial Action Construction Schedule, including specific project completion and milestone dates.

The cost estimates will be prepared using appropriate cost data from *Means Site Work and Landscape Cost Data* and from construction projects with similar scope. The Pre-Final Design will be submitted to the U.S. EPA for review and comment within 60 days following receipt of U.S. EPA comments on the Intermediate Design Submittal.

If necessary, Final Design activities will be initiated after receipt of U.S. EPA's comments on the Pre-Final Design. The final design activities will involve response to U.S. EPA comments on the Pre-Final Design. The Final Design will be submitted to the U.S. EPA for review and comment within 60 days following receipt of U.S. EPA comments on the Pre-Final Design Submittal.

5.0 SUPPORTING PLANS

A series of additional plans are needed to support the Remedial Design and Remedial Action activities. These include:

- Performance Standards Verification Plan
- Construction Quality Assurance Plan
- Construction Health & Safety Plan/Contingency Plan
- Field Sampling Plan, with associated Health & Safety Plan and Quality Assurance Project Plan
- Operation and Maintenance Plan

5.1 PERFORMANCE STANDARDS VERIFICATION PLAN

A Performance Standards Verification Plan will be prepared to describe the performance monitoring that will be conducted to demonstrate that the proposed design achieves the short- and long-term performance standards established for the Remedial Action. The plan will also incorporate, or reference, appropriate sampling methodologies, health and safety considerations, and quality assurance requirements for the standards verifications activities.

The draft Performance Standards Verification Plan will be included with the Intermediate Design Submittal. If necessary, the Performance Standards Verification Plan will be upgraded or revised and be re-submitted with the Pre-Final and/or Final Design Submittals.

5.2 CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

A Construction Quality Assurance Project Plan will be prepared to provide guidance for project organization and project responsibility. The Construction Quality Assurance Project Plan will identify site-specific quality control (QC) and quality assurance (QA) responsibilities to assure that the completed project meets or exceeds the requirements of the approved plans and specifications. At a minimum, the plan will address the following elements:

- Define the responsibilities and authorities of all organizations and key personnel involved in the design and construction of the Remedial Action.

- Present qualifications of the proposed Quality Assurance Manager to demonstrate that he possesses the training and experience necessary to fulfill the identified responsibilities.

- Identify specific construction quality control testing requirements that will be used to monitor construction, including associated sample requirements (size, location, frequency), acceptance/rejection criteria, methodology for resolution of problems, reporting and documentation requirements, etc.

- Identify specific construction quality assurance protocols that will be used to evaluate construction quality control activities, including example daily summary forms, inspection data sheets, problem identification/corrective measures reports, and provisions for storage of records.

The specific quality assurance and quality control requirements for the CMSD cap construction will be developed in accordance with U.S. EPA guidance as presented in *Construction Quality Management for Remedial Action and Remedial Design Waste Containment Systems*, *Quality Assurance/Quality Control for Waste Containment Facilities* and other pertinent documents.

The draft Construction Quality Assurance Project Plan will be included with the Intermediate Design Submittal. If necessary, the Construction Quality Assurance Project Plan will be upgraded or revised and be re-submitted with the Pre-Final and/or Final Design Submittals.

5.3 CONSTRUCTION HEALTH & SAFETY/CONTINGENCY PLAN

A Construction Health and Safety/Contingency Plan (H&S/CP) will be developed that is sufficient to protect construction personnel from potential physical, chemical, and/or biological hazards posed by the Remedial Action. The plan will be presented as a specification describing the minimum health, safety and emergency response requirements for which the construction contractor will be made responsible, and which must be included in the contractor-specific H&S/CP to be develop by the selected remediation contractor. The plan will require conformance with U.S. EPA guidance, OSHA requirements as outlined in 29 CFR 1910 and 1926, and will include information and minimum acceptable criteria/qualifications for the following:

- Facility Description

- Personnel Training
- Levels of Protection
- Safe Work Practices and Safe Guards
- Medical Surveillance
- Personnel and Environmental Air Monitoring, if needed
- Personal Protective Equipment
- Personal Hygiene
- Decontamination, Personnel and Equipment
- Site Work Zones
- Contaminant Control
- Contingency and Emergency Planning
- Logs, Reports, and Record keeping

The draft H&S/CP specifications will be included with the Intermediate Design Submittal. If necessary, the H&S/CP specifications will be upgraded or revised and be re-submitted with the Pre-Final and/or Final Design Submittals.

5.4 FIELD SAMPLING PLAN

A Field Sampling Plan will be developed to describe field sampling activities needed to support the activities outlined in the Performance Standards Verification Plan. The plan will present requirements for the collection and analysis of soil, sediment, surface water, and ground water, as needed. The plan will be developed in accordance with applicable provisions of *Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA*, and will present standard procedures (collection protocols, sample identifications requirements, preservation requirements, analytical testing requirements, etc.) for all anticipated media. The Field Sampling Plan will be complimentary to the site-specific Quality Assurance Project Plan (which accompanies this Work Plan) that was developed for the Remedial Design and all future phases of site work.

The draft Field Sampling Plan will be included with the Intermediate Design Submittal. If necessary, the Field Sampling Plan will be upgraded or revised and be re-submitted with the Pre-Final and/or Final Design Submittals.

5.5 OPERATIONS AND MAINTENANCE PLAN

A draft Operations and Maintenance Plan will be prepared as part of the Remedial Design activities. The plan may include, but not be limited to descriptions of the following:

- Equipment
- Normal operation and maintenance
- Potential operating problems
- Routine monitoring and laboratory testing (including ground water and surface water monitoring)
- Alternate operations and maintenance
- Possible Corrective Actions
- Safety
- Records and reporting mechanisms

A detailed monitoring schedule will also be included in the Operations and Maintenance Plan.

At this time, it is anticipated that the Operations and Maintenance Plan will include provisions for periodic inspection and repair of:

- Security fencing and warning signs
- RCRA cap
- Stormwater drainage systems
- Ground water collection system
- Seep collection system

Specific activities may include performing ground water monitoring; inspecting the perimeter security fence for damage, operating condition of locks, and presence of signs; observations of the final cover system for indications of erosion (cover or drainage ditches), evidence of burrowing animals and/or deep rooted vegetation, evidence of differential settlement, and evidence of damage to the monitoring wells. In addition, anticipated cover maintenance activities consist of mowing (brush-hogging) the cover vegetation twice per year and re-vegetating bare spots as needed. Finally, the CMSD Seep and ground water collection and treatment/pre-treatments systems will require provisions for routine system maintenance including leak inspections and walk-throughs. A summary of the anticipated operations and maintenance activities for ground water monitoring; periodic security inspection and repair; seep collection and pre-treatment, and ground water collection/treatment system is presented in Table 4.

The draft Operations and Maintenance Plan will be included with the Pre-Final Design Submittal. If necessary, the draft Operations and Maintenance Plan will be upgraded or revised and be re-submitted with the Final Design Submittal.

The final Operations and Maintenance Plan will be submitted to U.S. EPA following completion of the Remedial Action construction activities, no later than at the Pre-Final Construction Inspection.

6.0 REMEDIAL ACTION ACTIVITIES

Following U.S. EPA approval of the Remedial Design, Ormet Primary will implement the Remedial Action activities in accordance with the requirements established in the Consent Decree and approved Final Design. Additional information regarding the remedial action activities is presented below.

6.1 PROCUREMENT ACTIVITIES

Concurrent with or prior to U.S. EPA's review of and comment on the Final Design submittal, bid documents for procurement of remedial construction services will be prepared. The bid documents will include detailed instructions to bidders, proposal forms, schedule of prices and payment, contract general and special conditions, technical specifications, and contract drawings.

6.1.1 Solicitation of Bids/Site Visit

Following final approval of the design and bid documents by the U.S. EPA, bids will be solicited by formal advertisement. A pre-bid conference will be held to clarify the intent of the bid documents and to answer questions regarding the design or implementation of the construction. A site visit will also be scheduled to familiarize the contract bidders with the site.

Sealed bids will be accepted at a specific place, time and date to be determined. Bids will be opened, read, and recorded.

6.1.2 Bid Review

Bid proposals will be reviewed for completeness by Ormet Primary. The bid review will include a determination of whether or not the bidders are responsive to the requirements of the bid documents, and responsible to complete the work required within the required time frame. The review may include, but may not be limited to, review of the bidders and proposed subcontractors related work experience and qualifications, their construction equipment and manpower availability, and insurance and bond requirement fulfillment. The bidder's proposed schedule for completion, and cost estimates for completion of the work will be heavily weighed.

6.1.3 Contractor Selection

The contract will be awarded to the bidder who Ormet Primary determines provides the most advantageous bid. The bidder to whom the award is made will be notified within 60 days of U.S. EPA approval of the Final Design.

6.2 MONITORING AND OVERSIGHT

Following contractor selection, implementation of construction will begin. Within 15 days following contract award, a pre-construction inspection and meeting will be held at the site to discuss the proposed remedial construction activities with all appropriate parties. This will include discussions of:

- Methods for documenting and reporting inspection data.
- Methods for distributing and storing documents and reports.
- Review of work area safety and security protocols.
- Discussions of any appropriate modifications to the Construction Quality Assurance Project Plan to ensure that site- and project-specific considerations are addressed.

- Conduct a site reconnaissance to verify that the design criteria, plans, and specifications are understood and to review proposed material and equipment storage locations

A summary of the information discussed and agreements reached at the pre-construction inspection shall be documented by a representative of Ormet Primary, and be distributed to the attendees within 7 days following the meeting.

Construction of the approved Remedial Design will be initiated within 15 days following the pre-construction meeting, subject to limitations associated with seasonal weather considerations.

6.2.1 Inspections

An engineer with expertise in construction projects and proceedings will be retained to provide quality assurance services for the construction activities. The construction quality assurance manager will be an Ohio Registered Professional Engineer, and will implement quality assurance activities as described in the approved construction Quality Assurance Project Plan.

Construction activities will be observed to assess compliance with contract requirements. Daily logs of construction activities and construction QA/QC procedures will be maintained. In the event that work is not in compliance with the contract requirements, actions to resolve the discrepancies will be initiated. Records of daily activities and conformance testing will be maintained to support closure certification.

6.2.2 Observation and Testing

The excavation, transportation, and placement of contaminated soil and sediment; construction of the soil flushing system; installation of the seepage collection and pre-treatment systems; and re-grading and capping of the CMSD will require quality assurance/quality control observation and testing. This will be conducted by, or monitored by, appropriately trained personnel acting under the supervision and control of the construction quality assurance manager. Observation will be performed to verify that construction methodologies are consistent with the procedures specified in the remedial design specifications.

6.2.3 Reporting

Throughout the duration of the construction, progress reports will be prepared and submitted on a monthly basis to the U.S. EPA. Reports will include, but not be limited to:

- Percent of total project completion and cost information.
- Summaries of work performed.
- Change orders and claims made on the contract.
- Construction problems encountered.
- Copies of daily reports, change orders, RCRA manifests, results of field and/or laboratory testing/analysis.
- Project work for the next reporting period.
- Assessment of conformance with the construction schedule with updated schedules if needed.

6.3 REMEDIAL ACTION COMPLETION AND ACCEPTANCE

Certification of construction that the remedy is operational and functional will involve performing site observations and testing to assess conformance to the contract specifications. As stipulated in the Consent Decree, two formal field construction inspections, pre-final and final, will be performed with the Remedial Action contractor.

6.3.1 Pre-final Conference and Inspection

Within 30 days following Ormet Primary's determination that construction is substantially complete, it will notify U.S. EPA to schedule a pre-final inspection conference. It will also forward a copy of the final Operations and Maintenance Plan for U.S. EPA review prior to the meeting.

The pre-final inspection will be attended by representatives of the U.S. EPA, the contractor, Ormet Primary, and the resident engineer. The parties will conduct a walk through of the entire project site to assess if the construction is consistent with the requirements of the contract documents. During this walk through, the treatment equipment will be operationally tested. Items of construction which are yet to be completed will be noted.

A pre-final construction inspection report will be prepared and submitted to the U.S. EPA within 30 days following the inspection. The report shall outline outstanding construction items, a schedule of completion for the items, and proposed date for the final construction inspection.

6.3.2 Final Inspection and Certification

Within 30 days following completion of all outstanding construction items identified in the pre-final construction inspection, Ormet Primary will contact the U.S. EPA to conduct a final construction inspection. It will be attended by representatives of U.S. EPA, the contractor, Ormet Primary, and the resident engineer. The Final Construction Inspection will consist of a walk-through inspection of the entire project site. The Pre-Final Construction Inspection Report will be used as a checklist during the Final Construction Inspection focusing on the outstanding construction items identified in the Pre-Final Construction Inspection.

Within 60 days following the final construction inspection, a construction completion report will be prepared and submitted to the U.S. EPA. The report may include, but may not be limited to:

- Brief description of the outstanding construction items identified during the pre-final inspection and an indication that the items have been resolved.
- Synopsis of the work defined in the Statement of Work and a certification that this work was performed.
- Explanation of any variation of the work defined in the Statement of Work and why the variations were necessary.
- Certification that the remedy is operational and functional.

The report will also include as-built drawings, signed and sealed by the construction Quality Assurance Manager (a registered professional engineer), describing the completed construction. In addition, it will include a statement signed by the construction Quality Assurance Manager and Ormet Primary's Project Coordinator as follows:

"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

6.4 FINAL COMPLETION AND REMEDIAL ACTION CERTIFICATION

Within 90 days following attainment of all ground water performance standards and soil cleanup, Ormet Primary will contact the U.S. EPA to conduct a pre-certification inspection.

Within 30 days following U.S. EPA approval of the pre-certification inspection, a Completion of Remedial Action Report will be prepared and submitted to the U.S. EPA. The report will present the results of sampling and analysis to demonstrate that cleanup standards have been attained within the FSPSA, and include a statement from Ormet Primary's Project Coordinator that the Remedial Action has been completed in full satisfaction to the requirements of the Consent Decree.

TABLE 1

REMEDIAL ACTION CLEANUP STANDARD SUMMARY

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

Constituent	Ground Water Cleanup Standard (µg/L)	Backwater Area Sediment Cleanup Standard (µg/kg)	CRDA Soil Cleanup Standard (µg/kg)	FSPSA Soil Cleanup Standard
Volatile Organic Compounds				
Tetrachloroethene	5	— (1)	—	—
Semivolatile Organic Compounds				
Carcinogenic PAHs, Total	—	60,000	60,000	—
Benzo(a)Anthracene				
Benzo(b)Fluoranthene				
Benzo(k)Fluoranthene				
Benzo(g,h,i)Perylene				
Benzo(a)Pyrene				
Indeno(1,2,3-cd)Pyrene				
Dibenz(a,h)Anthracene				
Chrysene				
Inorganics Compounds				
Arsenic	To be defined (2)	—	—	To be defined
Beryllium	4	—	—	To be defined
Cyanide, Total	200	—	—	To be defined
Manganese	To be defined (2)	—	—	To be defined
Vanadium	260	—	—	To be defined
Fluoride	4,000	—	—	To be defined
Other				
Polychloronated Biphenyls	—	1,000	1,000 (3)	—

Notes:
1 "-" denotes no standard is defined.
2 Ground Water Cleanup Standrads for manganese and arsenic will be defined during Remedial Design after consideration of background values.
3 Initial standard. Ormet Primary may petition for an alternate CRDA Soil Cleanup Standard based upon industrial land use scenarios.

TABLE 2

PRE-DESIGN ACTIVITY IMPLEMENTATION SCHEDULE

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

Description	Anticipated Duration/Time Constraint
CMSD/Outfall 004 Area Soil Investigation	
U.S. EPA notification of sample collection activities	28 days in advance of sample collection activities
Sample collection activities	1 week
Laboratory analysis of selected samples	5 weeks
Report Preparation	3 weeks
Report submission to U.S. EPA	Within 120 days of RD Work Plan approval
Backwater Area Sediment Investigation	
U.S. EPA notification of sample collection activities	28 days in advance of sample collection activities
Sample collection activities	1 week
Laboratory analysis of selected samples	5 weeks
Report preparation	3 weeks
Report submission to U.S. EPA	Within 120 days of RD Work Plan approval
Background Manganese and Arsenic Level Assessment	
Report preparation	Up to 17 weeks
Report submission to U.S. EPA	Within 120 days of RD Work Plan approval
Ground Water Constituent Mass-in-Place Estimate	
Report preparation	Up to 17 weeks
Report submission to U.S. EPA	Within 120 days of RD Work Plan approval
FSPSA Soil Treatability Study	
U.S. EPA notification of sample collection activities	28 days in advance of sample collection activities
Sample collection activities	1 week
Implementation of first phase bench scale flushing	1 week
Laboratory analysis of first phase flushing samples	3 weeks
Implementation of second phase bench scale flushing	1 week
Laboratory analysis of second phase flushing samples	3 weeks
Report preparation	4 weeks
Report submission to U.S. EPA	Within 120 days of RD Work Plan approval
CMSD Seep Treatability Study	
U.S. EPA notification of sample collection activities	28 days in advance of sample collection activities
Sample collection activities	1 week
Laboratory analysis of selected field samples	3 weeks
Implementation of seep sample bench scale testing	1 week
Laboratory analysis of seep bench scale samples	3 weeks
Report preparation	5 weeks
Report submission to U.S. EPA	Within 120 days of RD Work Plan approval

TABLE 3

ANTICIPATED DRAWINGS FOR PRELIMINARY DESIGN

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

---

1. Site Plan - Existing Conditions (North)
2. Site Plan - Existing Conditions (South)
3. Plan View - Proposed Regraded CMSD Cap Subgrade
4. Plan View - Proposed CMSD Cap
5. Cross-Sections Depicting Regraded CMSD and Cap
6. Plan View - FSPSA Soil Flushing System
7. Plan View - CRDA and Backwater Area Excavation
8. Piping and Instrument Diagrams - FSPSA Soil Flushing and CMSD Seep Pre-treatment Systems
9. Site Plan - Post Remediation
10. Stormwater Drainage Plan

TABLE 4

ANTICIPATED DRAWINGS FOR INTERMEDIATE/FINAL DESIGN

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

---

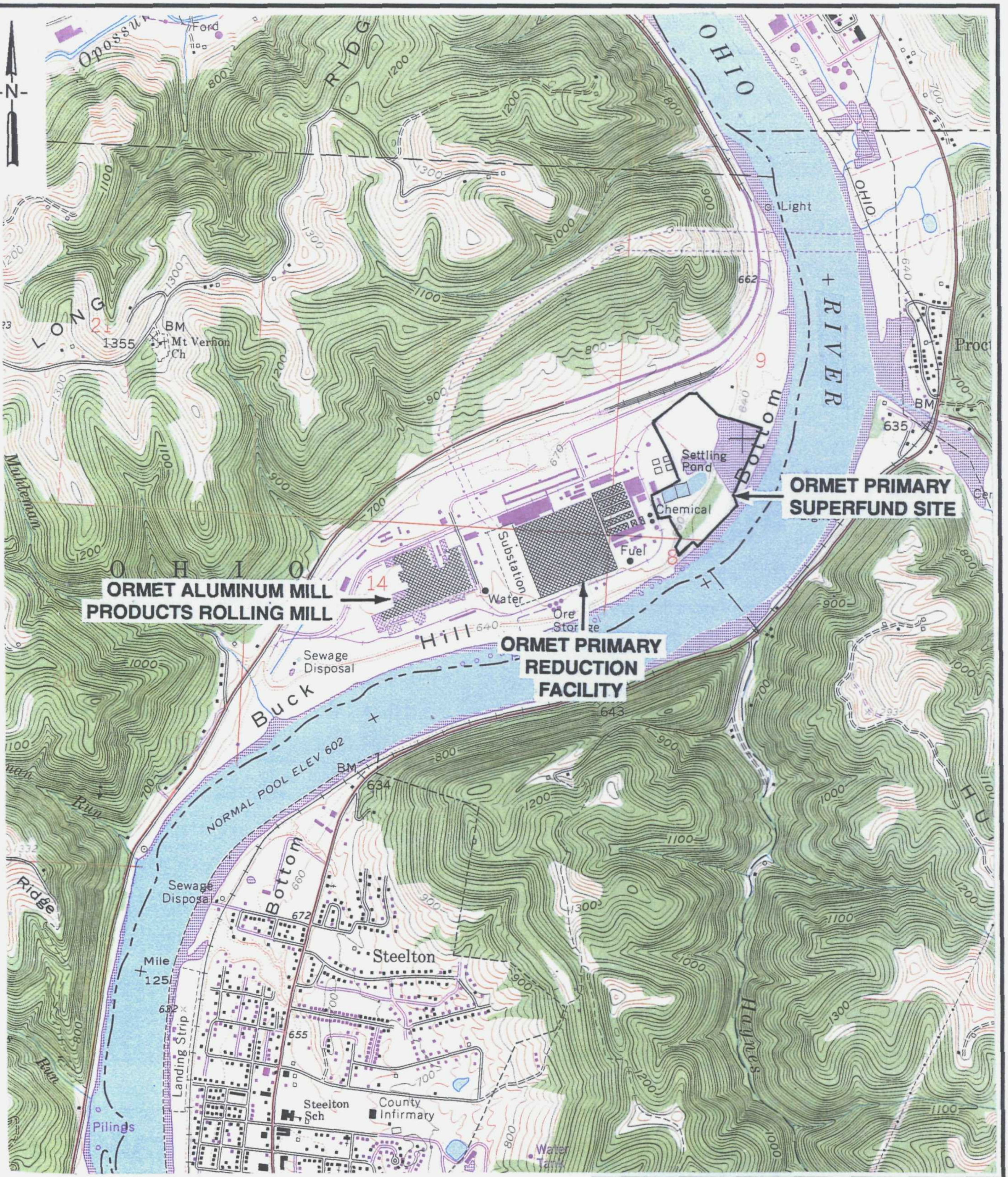
1. Site Plan - Existing Conditions (North)
2. Site Plan - Existing Conditions (South)
3. Plan View - Proposed Regraded CMSD Cap Subgrade
4. Plan View - Proposed CMSD Cap
5. Cross-Sections Depicting Regraded CMSD and Cap
6. Construction Details - Miscellaneous (Cap, stormwater controls, etc.)
7. Plan View - FSPSA Soil Flushing System
8. Electrical Schematic - FSPSA Soil Flushing and CMSD Pre-treatment Systems
9. Piping and Instrument Diagram - FSPSA Soil Flushing and CMSD Pre-treatment Systems
10. Pipe Routing - FSPSA Soil Flushing and CMSD Pre-treatment Systems
11. Construction Details - Piping
12. Plan View - CRDA and Backwater Area Excavation
13. Site Plan - Post Remediation
14. Stormwater Drainage Plan

TABLES5 5

SUMMARY OF ANTICIPATED POST-CLOSURE ACTIVITIES

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

Item	Activity	Initial Frequency
Security/fence	Check presence and conditions of fencing; gate; signs	Semi-annual
Erosion damage	Check for bare spots; signs of damaged vegetation; areas of washout	Semi-annual
Mowing and vegetation	Mow grass; check for bare areas and erosion damage	Semi-annual
Ground water monitoring	Collect ground water samples; check for physical signs of damage to casing, cap locking system	3 times per year
Ground water collection and treatment	Conduct system walk-through and record process parameters	Weekly
	Conduct system walk-through; conduct water sampling/analysis	Monthly
FSPSA Flushing systen	Conduct system check and record flow parameters	Weekly
CMSD seep collection and pre-treatment	Conduct system check and record flow readings	Monthly



0 2000 4000

SCALE IN FEET

Quadrangle Location

BASE MAP SOURCE: USGS 7 1/2 minute topographic quadrangle map New Martinsville, West Virginia-Ohio 1960, photorevised 1972 and 1976.

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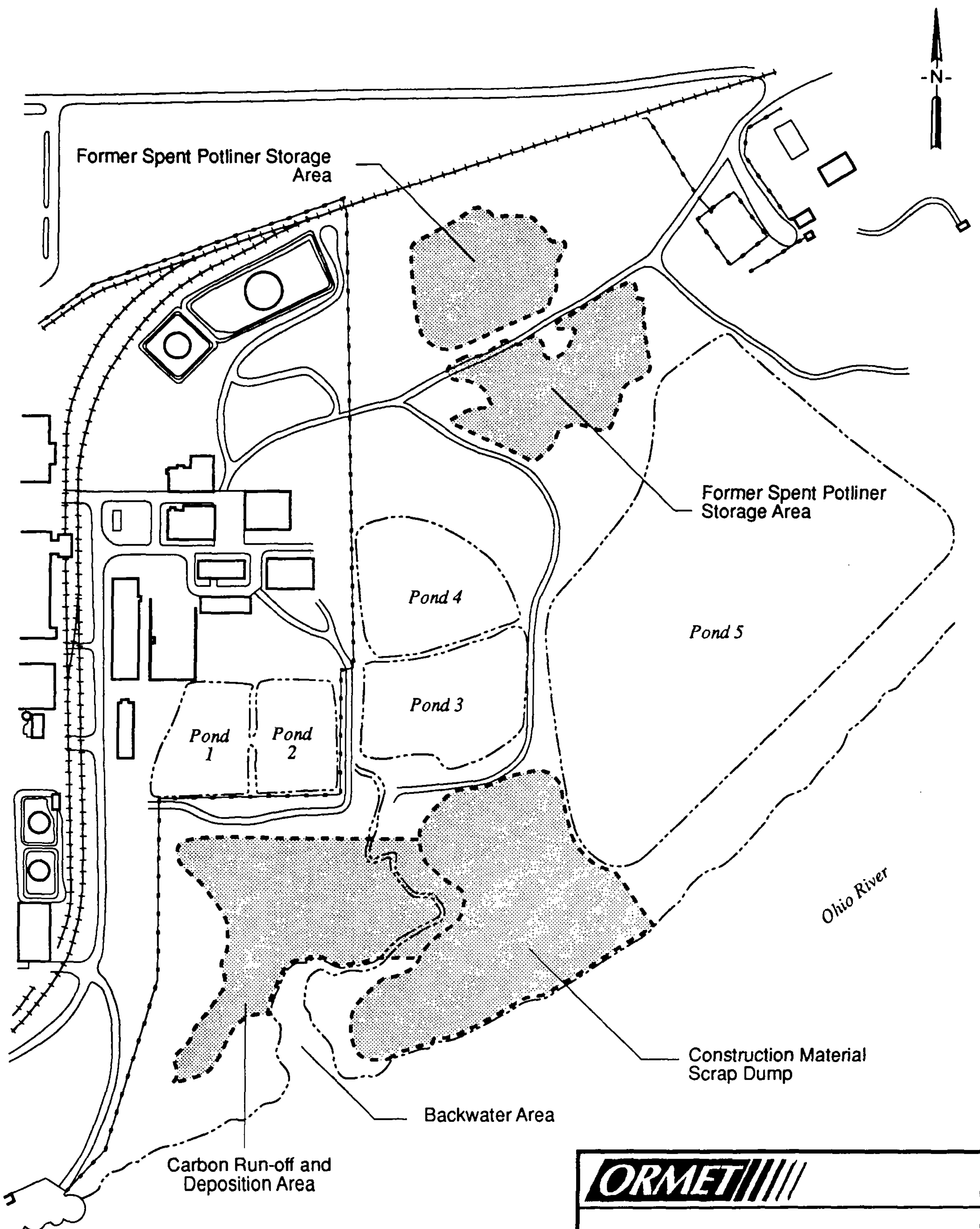
FIGURE 1
SITE VICINITY MAP

JOB NO. 07983-032-006 Dames & Moore

ORMET-032-5050-00b-REMED. DSG. W.P.



NOT TO SCALE

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FIGURE 2
UNIT LOCATION MAP

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Dames & Moore

ORMET-032-5050-006-REMED. DSG. W.P.

SDMS US EPA Region V

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FIGURE 3, 4, & 6

☐ **Other:**

TIME (DAYS): 0 30 60 90 120 | USEPA REVIEW AND COMMENT | 0 30 60 | USEPA REVIEW AND COMMENT | 0 30 60 | USEPA REVIEW AND COMMENT | 0 30 60 | USEPA REVIEW AND APPROVAL

ACTIVITY	Other
Remedial Design Activites	
• Pre-Design Studies	(See Table 2)
• Preliminary (30%) Design	Within 120 Days of RD Work Plan Approval
• Intermediate (60%) Design	Within 60 Days of Receipt of USEPA Comments on Preliminary Design
• Pre-Final Design	Within 60 Days of Receipt of USEPA Comments on Intermediate Design
• Final Design	Within 60 Days of Receipt of USEPA Comments on Prefinal Design
Remedial Action Activities	
• Bidding and Contractor Procurement	Within 60 Days of Final U.S.E.P.A. Remedial Design Approval
• Pre-Construction Meeting	Within 15 Days of Contract Award
• Initiate Construction	Within 30 Days of Contract Award (Weather Permitting)
• Remedial Construction	To Be Determined
• Operation and Maintenance Plan	At or Before Pre-Final Inspection
• Pre-Final Inspection	Within 30 Days After RA Construction Completed
• Final Inspection	Within 30 Days of Completion of Additional Work (If Needed)
• Construction Completion Report	Within 30 Days Following Final Inspection
Performance Monitoring Activities	
• Pre-Certification Inspection	90 Days Following Attainment of Performance Standards
• Remedial Action Completion Report	30 Days After Pre-Certification Inspection

LEGEND:

—— Time Allotted for Task Completion

△ Milestone

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FIGURE 5
REMEDIAL DESIGN / REMEDIAL ACTION SCHEDULE

JOB NO. 07983-032-006

Dames & Moore

APPENDICES

APPENDIX A

CMSD/OUTFALL 004 AREA SOIL INVESTIGATION WORK PLAN

APPENDIX A

CMSD OUTFALL 004 AREA SOIL INVESTIGATION WORK PLAN

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

1.0 INTRODUCTION

This document presents a work plan for an investigation designed to evaluate the presence/absence and possible extent of surficial soil contamination between the western limit of the CMSD and the Outfall 004 stream at the Ormet Primary Aluminum Corporation (Ormet Primary) Superfund Site in Hannibal, Ohio. No soil sampling was performed in this area during the Remedial Investigation.

The surficial soil investigation is being performed as part of the pre-design activities associated with the Remedial Design program, as required under Section VI.11.b.3 of the Consent Decree.

2.0 INVESTIGATION ACTIVITIES

The purpose of the soil investigation is to determine the presence or absence, and possible horizontal and vertical extent, of polychlorinated biphenyls (PCBs) in soil between the western limit of the CMSD and the Outfall 004 stream. The extent of contamination will determine the area requiring remediation by excavation of contaminated soil and disposal in the CMSD, or off-site (depending upon representative PCB concentrations identified in stockpiled material during construction).

Information regarding the sample collection and analysis activities is presented below.

2.1.1 Sample Location Selection

Soil samples will be collected from the area designated in the Consent Decree as requiring additional characterization. A total of eight surficial soil samples will be collected at approximately 100-foot intervals, at the approximate locations indicated in Figure A-1.

To determine final sampling locations, a field reconnaissance will be performed. Biased samples will be collected from areas showing evidence of contamination, such as staining or stressed vegetation. Surface drainage patterns will also be identified in the field, and soil samples will be collected from dry ditches or swales that may intermittently carry runoff from the area of the CMSD. A wooden stake, marked with the sample identification number, will be installed at each sampling location to facilitate subsequent location of the sampling point, if necessary.

2.1.2 Sample Collection

Surface soil samples will be collected using hand auguring equipment, drive cylinders, and/or stainless steel scoops. Prior to sampling, the vegetation layer (if present) will be scraped away using a stainless steel scoop or trowel. Grab samples will be collected from depth intervals of 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches in order to allow vertical characterization of PCB concentrations, if any, at each sampling point, if required. Except for field duplicates, samples will be transferred directly from the auger bucket, cylinder, or scoop into a pre-cleaned laboratory-supplied sample container. For field duplicates, samples will be transferred from the auger bucket, cylinder, or scoop into a transfer container. The field duplicate samples will be mixed, as practical, using a scoop and then transferred into a pre-cleaned laboratory-supplied sample container.

As part of the QA/QC program, blind duplicate and equipment wash blank samples will be collected. One blind duplicate will be prepared for every ten soil samples collected. The blind duplicate will be split from material recovered from a unique sample location and depth. The blind duplicate will be identified as "Duplicate", with no indication as to which actual sample serves as its match. The blind duplicate sample will be collected to allow an evaluation of sample reproducibility. The equipment wash blank will provide a check for procedural contamination (effectiveness of field decontamination procedures) and/or ambient conditions at the site that may have caused sample contamination. One equipment wash blank, prepared using the final rinsate of the decontamination procedure, will be collected for each sample shipment. In addition, a site-specific matrix spike/matrix spike duplicate sample will be utilized by the analytical laboratory on each sample batch to check accuracy of the reported concentrations with a known concentration.

All samples will be placed in transport coolers and stored on ice at approximately 4 °C. Samples will be transported under chain-of-custody via overnight rapid delivery service to the analytical laboratory (KEMRON Environmental Services of Marietta, Ohio).

2.3 DECONTAMINATION PROCEDURES

Sampling equipment such as hand augers, stainless steel scoops, stainless steel bowls, and other hand tools that come into direct contact with surface soil samples will be decontaminated as follows:

- Clean with tap water and laboratory detergent using a brush, if necessary, to remove particulate matter and surface films
- Rinse thoroughly with tap water
- Rinse thoroughly with distilled water
- Air dry
- Wrap small pieces of equipment in aluminum foil for transportation or storage

2.4 ANALYTICAL PROCEDURES

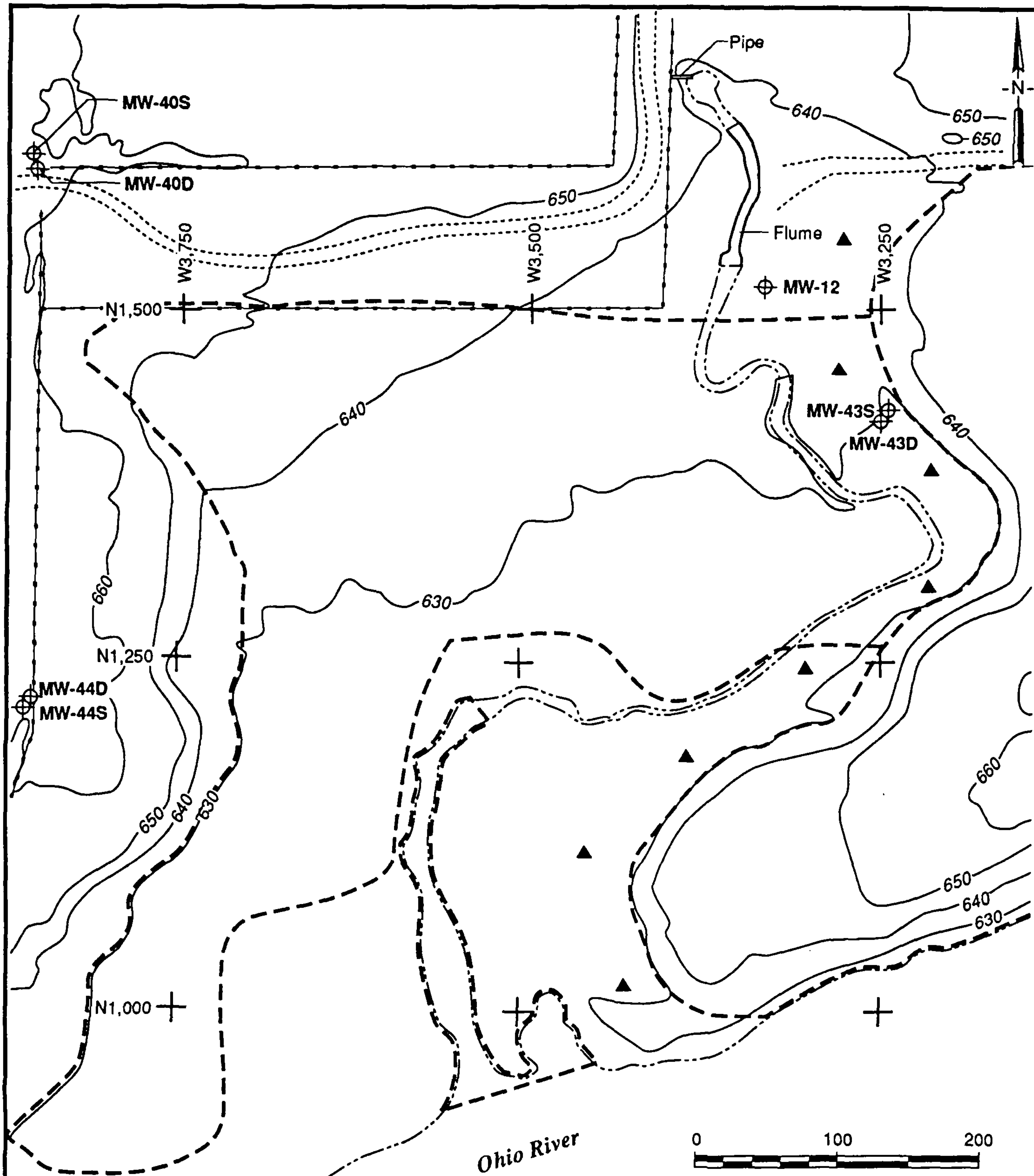
Samples from each location will be analyzed using the appropriate analytical procedures and protocols as specified in the U.S. Environmental Protection Agency (U.S. EPA's)*Test Methods for Evaluating Solid Waste*, SW-846 (Final Update II), Third Edition, November 1986. Each sample collected from the remediation area will be extracted, and selected samples will be analyzed for PCBs in accordance with SW-846 (Final Update II) Method 8080. The samples from each location will be analyzed by depth, in sequential fashion, until an interval is determined to have a PCB concentration of 1 milligram per kilogram (1 ppm) or less, or all samples have been analyzed.

Laboratory data validation procedures will be performed on all environmental sample data in accordance with the *U.S. EPA's Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994.*

Data collected during the soil investigation will be used to prepare a map that delineates the areal extent of PCBs in surfical soil. The map will be used to estimate the volume of soil to be excavated and serve as a guide for soil remediation activities that will be performed as part of the Remedial Action.

3.0 REPORTING

The results of the investigation will be presented in a report that will be submitted to U.S. EPA with the Preliminary Design submittal. The report will present information collected during the investigation including, but not limited to: a summary of field activities and procedures, the results of all analytical testing, and a discussion of the data that presents conclusions and recommendations. In addition, it will include a map that shows the extent of soil exceeding the established PCB Cleanup Standards and calculations to estimate the volume of material that will require remediation during the Remedial Action program.



LEGEND:

- Approximate Unit Limit
- Fence
- Dirt Roadway
- —650— Topographic Contour
- N1,000 Plant Grid Coordinate
- MW-44S Monitoring Well Location and Number
- ▲ Approximate Soil Sample Location

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FIGURE A-1
SOIL SAMPLE LOCATIONS

JOB NO. 07983-032-006

Dames & Moore

ORMET-032-5050-006-REMED. DSG. W.P.

APPENDIX B

BACKWATER AREA SEDIMENT INVESTIGATION WORK PLAN

APPENDIX B

BACKWATER AREA SEDIMENT INVESTIGATION WORK PLAN

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE HANNIBAL, OHIO

1.0 INTRODUCTION

This document presents a work plan for an investigation designed to evaluate the approximate horizontal and vertical extent of polychlorinated biphenyls (PCBs) and carcinogenic polynuclear aromatic hydrocarbons (PAHs) in Backwater Area sediment at the Ormet Primary Aluminum Corporation (Ormet Primary) Superfund Site in Hannibal, Ohio. Limited sampling was performed in this area during the Remedial Investigation.

The sediment investigation is being performed as part of the pre-design activities associated with the Remedial Design program, as required under Section VI.11.b.3 of the Consent Decree.

2.0 INVESTIGATION ACTIVITIES

The purpose of the sediment investigation is to determine the approximate horizontal and vertical extent of PCBs and carcinogenic PAHs in sediment within the Backwater Area. The extent of contamination will determine the area requiring remediation by dredging of contaminated sediment and disposal in the CMSD, or off-site (depending upon representative PCB concentrations identified in stockpiled material during construction).

2.1 SAMPLING

Information regarding the sample collection and analysis activities is presented below.

2.1.1 Sample Location Selection

Sediment samples will be collected at four locations within the Backwater Area. The approximate sampling locations are depicted in Figure B-1. A wooden stake, marked with the sample identification number, will be installed at each sampling location to facilitate subsequent location of the sampling point, if necessary.

2.1.2 Sample Collection

Sediment samples will be collected using hand-operated, core-type samplers. The samplers will be pushed into the sediment by personnel wading in the Backwater Area, or from a low-draft boat. Sampling personnel will endeavor to minimize the suspension of sediment, as practical, during sampling activities. Representative grab samples will be collected from approximate depth intervals of 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches to allow vertical characterization of PCB and carcinogenic PAH concentrations at each sampling point, if required. Except for field duplicates, samples will be transferred directly from the sampling device into a pre-cleaned laboratory-supplied sample container. For field duplicates, samples will be transferred from the sampling device into a transfer container. The field duplicate samples will be mixed, as practical, using a scoop and then transferred into a pre-cleaned laboratory-supplied sample container.

As part of the QA/QC program, blind duplicate and equipment wash blank samples will be collected. One blind duplicate will be prepared for every ten sediment samples collected. The blind duplicate will be split from material recovered from a unique sample location and depth. The blind duplicate will be identified as "Duplicate", with no indication as to which actual sample serves as its match. The blind duplicate sample will be collected to allow an evaluation of sample reproducibility. The equipment wash blank will provide a check for procedural contamination (effectiveness of field decontamination procedures) and/or ambient conditions at the site that may have caused sample contamination. One equipment wash blank, prepared using the final rinsate of the decontamination procedure, will be collected for each sample shipment. In addition, a site-specific matrix spike/matrix spike duplicate sample will be utilized by the analytical laboratory on each sample batch to check accuracy of the reported concentrations with a known concentration.

All samples will be placed in transport coolers and stored on ice at approximately 4 °C. Samples will be transported under chain-of-custody via overnight rapid delivery service or by laboratory courier to the analytical laboratory (KEMRON Environmental Services of Marietta, Ohio).

2.3 DECONTAMINATION PROCEDURES

Sampling equipment such as the sampler and other hand tools that come into direct contact with sediment samples will be decontaminated as follows:

- Clean with tap water and laboratory detergent using a brush, if necessary, to remove particulate matter and surface films
- Rinse thoroughly with tap water
- Rinse thoroughly with distilled water
- Air dry, as practical
- Wrap small pieces of equipment in aluminum foil for transportation or storage

2.4 ANALYTICAL PROCEDURES

Samples from each location will be analyzed using the appropriate analytical procedures and protocols as specified in the U.S. Environmental Protection Agency (U.S. EPA's)*Test Methods for Evaluating Solid Waste*, SW-846 (Final Update II), Third Edition, November 1986. Each sample collected from the Backwater Area will be extracted, and selected samples will be analyzed for PCBs in accordance with SW-846 (Final Update II) Method 8080 and for carcinogenic PAHs (i.e., benzo(a) anthracene, benzo(b) fluoranthene, benzo(k) fluoranthene, benzo(g,h,i) perylene, benzo(a) pyrene, indeno(1,2,3-cd) pyrene, dibenz(a,h) anthracene, and chrysene) in accordance with SW-846 (Final Update II) Method 8270. The samples from each location will be analyzed by depth, in sequential fashion, until an interval is determined to have a PCB concentration of 1,000 micrograms per kilogram (1,000 parts per billion, or 1 part per million) or less, and a total carcinogenic PAH concentration of 60,000 micrograms per kilogram (60,000 parts per billion, or 60 parts per million) or less, or all samples have been analyzed.

Laboratory data validation procedures will be performed on all environmental sample data in accordance with the *U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994.*

Data collected during the sediment investigation will be used to prepare a map that delineates the areal extent of PCBs and carcinogenic PAHs in sediment. The map will be used to estimate the volume of sediment to be excavated and serve as a guide for sediment remediation activities that will be performed as part of the Remedial Action.

3.0 REPORTING

The results of the investigation will be presented in a report that will be submitted to U.S. EPA with the Preliminary Design submittal. The report will present information collected during the investigation including, but not limited to: a summary of field activities and procedures, the results of all analytical testing, and a discussion of the data that presents conclusions and recommendations. In addition, it will include a map that delineates the extent of sediment exceeding the established PCB and carcinogenic PAH Cleanup Standards and calculations to estimate the volume of material that will require remediation during the Remedial Action program.

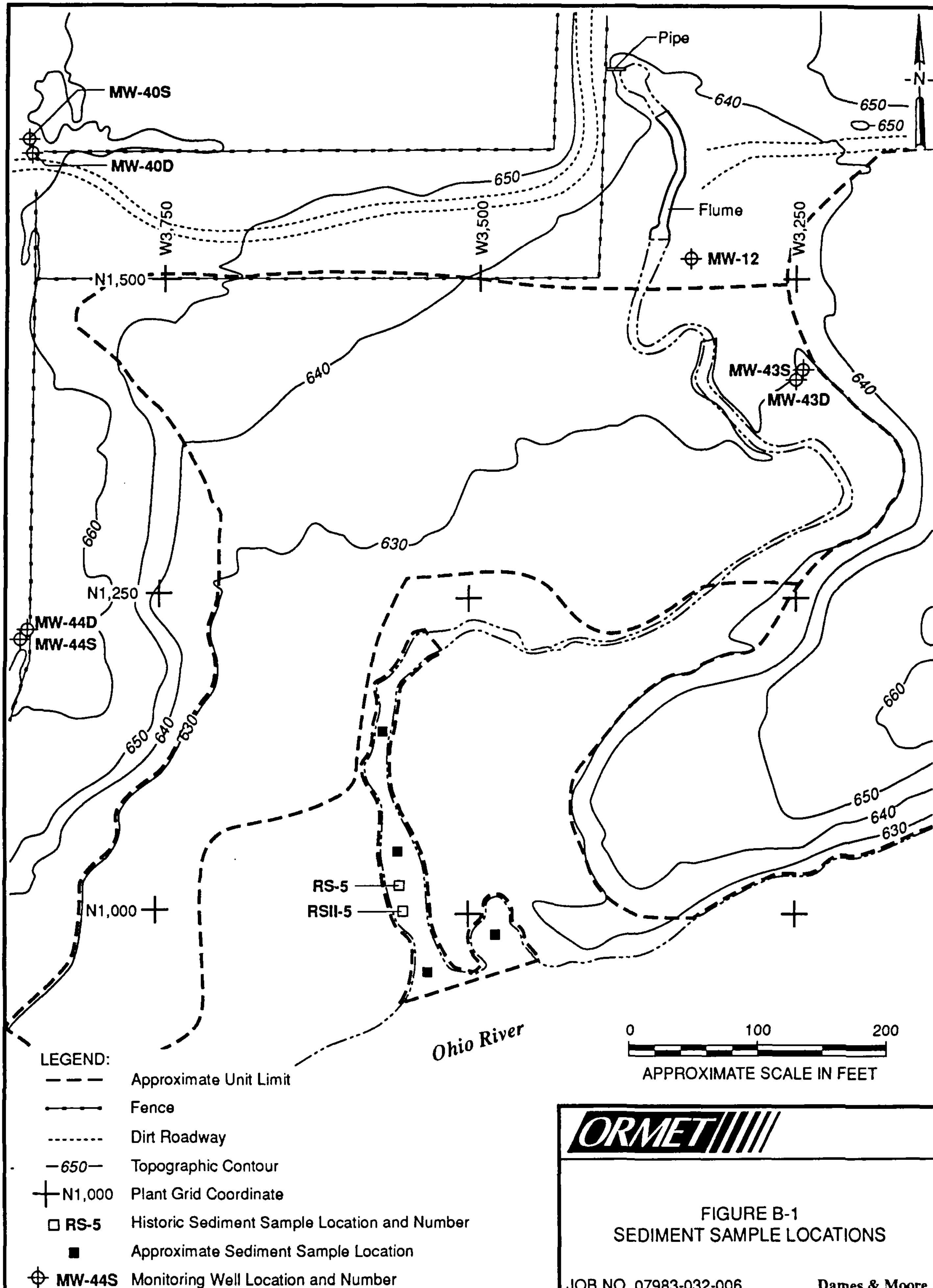


FIGURE B-1
SEDIMENT SAMPLE LOCATIONS

ORMET-032-5050-006-REMED. DSG. W.P.

APPENDIX C

STATISTICAL ANALYSES OF BACKGROUND LEVELS FOR MANGANESE AND ARSENIC IN GROUNDWATER

APPENDIX C

STATISTICAL ANALYSES OF BACKGROUND LEVELS FOR MANGANESE AND ARSENIC IN GROUND WATER

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE HANNIBAL, OHIO

In accordance with Section II.3.B. of the SOW, statistical analyses will be performed to determine background levels of manganese and arsenic in the alluvial aquifer beneath the Ormet site. For manganese, the results of the statistical analyses will be used to set a cleanup standard for manganese in ground water. For arsenic, the statistically determined background concentration will be used in a re-calculation of residual carcinogenic risk based on a residential exposure scenario. The results of the statistical analysis and the risk calculation will then be used to determine whether the cleanup standard for arsenic in ground water that was set forth in the ROD (i.e., 0.010 mg/L) should be amended.

The statistical analyses of manganese and arsenic will be conducted using data from ground-water monitoring wells not affected by the contaminant plume identified in the RI Report. In January 1995, Ormet conducted a sitewide ground-water monitoring event to update interpretations of ground-water quality presented in the RI Report. Prior to January 1995, the most recent sitewide monitoring event was conducted in June 1988 as part of the Phase I RI. During the January 1995 monitoring event, ground-water samples were collected from all MW-series monitoring wells at the site and analyzed for those parameters for which cleanup standards were established in the ROD (except tetrachloroethene) and other selected plume indicators, including the following:

Cyanide	Vanadium
Fluoride	Iron
Arsenic	Sodium
Beryllium	pH
Manganese	Specific Conductance

Analyses of the ground water samples were performed by KEMRON Environmental Services, Inc. of Marietta, Ohio, the laboratory that performed the majority of analyses during the RI. Results of these analyses are presented in Table C-1. The analytical results for the primary indicator parameters for the plume, including cyanide, fluoride, sodium, and pH, were used to construct the plume isopleth maps shown in Figures C-1 through C-4.

Based on these results, which are the most recent ground-water quality data for the site, wells not affected by the plume have been identified for use in the statistical analyses of background manganese and arsenic concentrations. These wells are the following:

MW-1	MW-20	MW-38
MW-4	MW-23s	MW-41
MW-7	MW-23d	MW-43s
MW-12	MW-33s	MW-43d
MW-19	MW-33d	

Available historical data for each of these wells will be used in the statistical evaluations, including data from the following sampling events:

December 1983	June 1988 (Phase I RI)
February 1984	February 1990 (Phase II RI)
September 1984	June 1994
May 1985	January 1995
May 1986	

The statistical background concentrations for manganese and arsenic will be determined by constructing a one-sided upper tolerance interval for each parameter from the available background data. The background concentration for each parameter will be set as the upper tolerance limit value having an average coverage of at least 95%. Construction of the upper tolerance interval and determination of the upper tolerance limit value will be conducted as described by USEPA (1989a, 1992a, 1992b).

Prior to conducting the statistical analyses, the arsenic and manganese data sets will be tested for normality using the Shapiro-Wilk test statistic. If a data set is determined not to be normally distributed, the data will be converted to the natural logarithm and tested for normality again. If the log values are normally distributed, they will be used to construct the tolerance interval and determine the upper tolerance limit (i.e., background) value. If neither the actual data nor the log data are normally distributed, the tolerance interval and upper tolerance limit value will be determined using a non-parametric approach as described in Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities - Addendum to Interim Final Guidance (USEPA, 1992b).

Once the background value for arsenic has been statistically determined, the residual carcinogenic risk will be re-calculated based on a residential exposure to ground water. The calculation of residual risk will be performed as described in the Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual, Interim Final (USEPA 1989b).

REFERENCES

U.S. Environmental Protection Agency (USEPA), 1989a. Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance. Office of Solid Waste, Washington, D.C. EPA/530-SW-89-026 February, 1989.

U.S. Environmental Protection Agency (USEPA), 1989b. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Interim Final. Office of Emergency and Remedial Response, Washington, D.C.

U.S. Environmental Protection Agency (USEPA), 1992a. Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance. Office of Solid Waste, Washington, D.C. July 1992.

U.S. Environmental Protection Agency (USEPA), 1992b. Methods for Evaluating the Attainment of Cleanup Standards, Volume 2: Ground Water. Office of Policy, Planning, and Evaluation, Washington, D.C. July, 1992.

TABLE C-1
ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES
COLLECTED JANUARY 5-12, 1995

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

SAMPLE I.D.: DATE:	MW-1 1/9/95	MW-2 1/11/95	MW-3 1/10/95	MW-4 1/10/95	MW-5 1/10/95	MW-7 1/10/95	MW-8 1/10/95	MW-9 1/12/95	MW-10 1/12/95	MW-11 1/10/95	MW-12 1/6/95	MW-13 1/6/95
pH (std. units)	6.2	10.0	6.0	6.9	8.6	5.5	7.8	6.9	7.0	7.6	7.4	7.1
Specific Conductance (µ	370	2400	620	590	1500	850	610	800	800	540	530	490
Cyanide, Total	0.02	7.1	0.62	<0.01	3.1	<0.01	0.09	0.02	0.02	0.02	<0.01	0.02
Cyanide, Amenable	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01
Fluoride	0.1	93	0.3	1.4	32	0.2	3.1	1.7	0.5	2.3	1.1	0.5
Arsenic	<0.004	0.085	<0.004	<0.004	0.008	0.040	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.04	8.6	1.4	<0.04	1.3	22	<0.04	0.05	<0.04	<0.04	<0.04	2
Manganese	0.39	0.82	1.4	6.8	0.27	2.3	0.08	<0.01	<0.01	0.40	1.5	2.9
Sodium	21	520	46	29	270	72	50	15	26	30	23	23
Vanadium	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

SAMPLE I.D.: DATE:	MW-14 1/6/95	MW-15 1/5/95	MW-16 1/9/95	MW-17 1/5/95	MW-18 1/9/95	MW-46 MW-18 Dup. 1/9/95	MW-19 1/6/95	MW-20 1/9/95	MW-21S 1/12/95	MW-21D 1/12/95	MW-22S 1/11/95	MW-22D 1/11/95
pH (std. units)	7.6	7.0	7.7	7.5	9.6	9.5	7.3	7.0	7.0	6.9	7.3	7.4
Specific Conductance (µ	530	720	850	710	5900	570	630	520	920	870	860	810
Cyanide, Total	0.06	0.49	1.4	0.64	15	12	<0.01	0.05	0.02	0.02	<0.01	<0.01
Cyanide, Amenable	<0.01	0.12	0.13	<0.01	6.6	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01
Fluoride	2.1	1.4	7.9	3.9	290	290	1.0	0.8	0.2	0.3	0.1	0.2
Arsenic	<0.004	<0.004	<0.004	<0.004	0.062	0.053	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	0.08	0.26	0.52	0.26	56	56	0.09	<0.04	<0.04	<0.04	<0.04	<0.04
Manganese	0.74	<0.01	1.1	1.9	0.22	0.24	<0.01	1.5	<0.01	0.02	<0.01	<0.01
Sodium	29	45	81	36	1500	1400	24	26	15	12	29	30
Vanadium	<0.01	<0.01	<0.01	<0.01	0.02*	<0.02*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

* = Elevated detection limit for vanadium due to matrix interference.
NOTE: All results in mg/L unless otherwise noted.

TABLE C-1
ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES
COLLECTED JANUARY 5-12, 1995

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

SAMPLE I.D.: DATE:	MW-23S 1/11/95	MW-23D 1/11/95	MW-24S 1/11/95	MW-24D 1/11/95	MW-25 1/11/95	MW-26S 1/11/95	MW-26D 1/11/95	MW-27 1/11/95	MW-28 1/9/95	MW-29S 1/9/95	MW-29D 1/9/95	MW-30 1/9/95
pH (std. units)	7.4	7.2	7.1	7.1	6.2	7.3	7.3	6.3	6.2	8.3	7.5	6.2
Specific Conductance (µr	870	820	860	870	560	800	760	1300	500	2900	650	430
Cyanide, Total	0.06	<0.01	<0.01	<0.01	0.18	<0.01	<0.01	0.06	0.74	0.79	0.22	0.01
Cyanide, Amenable	0.05	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	0.26	0.07	0.03	<0.01
Fluoride	0.7	1.3	0.6	1.3	0.1	0.1	0.2	0.4	2.7	56	3.7	<0.1
Arsenic	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.04	<0.04	<0.04	<0.04	0.10	<0.04	<0.04	0.96	0.38	0.37	0.09	0.78
Manganese	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	0.02	0.12	2.0	0.60
Sodium	24	28	26	24	34	31	27	160	79	590	33	19
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

SAMPLE I.D.: DATE:	MW-31 1/9/95	MW-32 1/5/95	MW-33S 1/6/95	MW-33D 1/6/95	MW-34S 1/5/95	MW-47 (MW-34s D 1/5/95	MW-34D 1/5/95	MW-35 1/5/95	MW-48 MW-35 Dup 1/5/94	MW-36 1/5/95	MW-37 1/5/95	MW-38 1/5/95
pH (std. units)	9.6	9.4	6.8	7.1	7.2	7.1	7.3	9.5	9.5	9.8	9.1	6.4
Specific Conductance (µr	1900	1300	630	560	700	720	640	1200	1100	3500	1200	190
Cyanide, Total	7.1	12	<0.01	<0.01	0.03	0.03	0.07	16	17	18	18	<0.01
Cyanide, Amenable	<0.01	3.6	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	89	47	1.9	1.1	7.3	6.4	4.2	35	51	160	87	0.1
Arsenic	0.027	0.014	<0.004	<0.004	<0.004	<0.004	<0.004	0.018	0.017	0.034	0.033	0.009
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	4.6	2.7	0.12	<0.04	0.18	0.06	<0.04	11	11	8.7	8.5	1.1
Manganese	0.66	0.37	2	6.3	0.01	<0.01	0.82	0.43	0.47	0.83	0.58	0.23
Sodium	420	230	33	28	35	37	34	220	230	770	280	11
Vanadium	<0.02*	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.01	<0.01

* = Elevated detection limit for vanadium due to matrix interference.
NOTE: All results in mg/L unless otherwise noted.

TABLE C-1
ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES
COLLECTED JANUARY 5-12, 1995

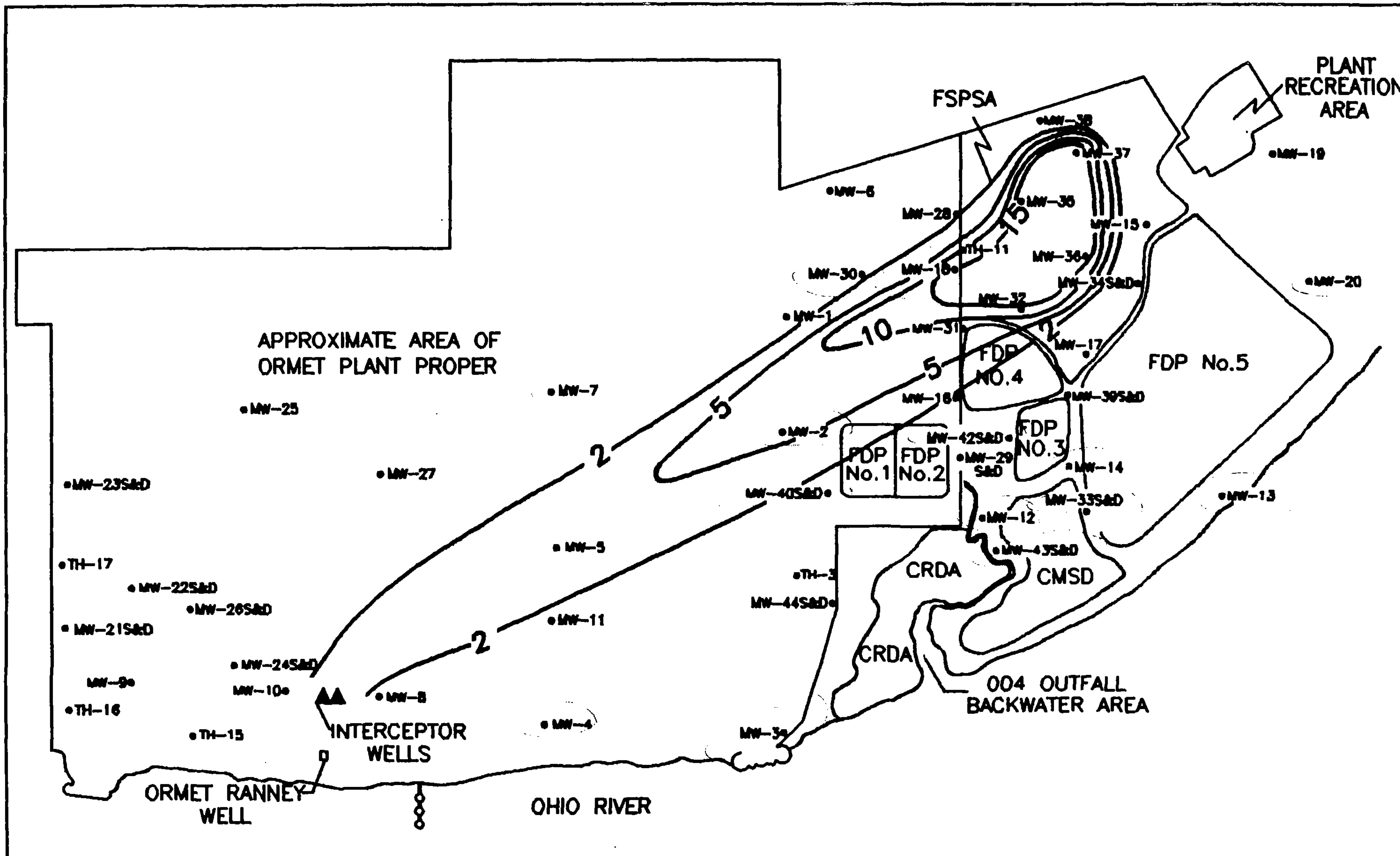
ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

SAMPLE I.D.:	MW-39S	MW-39D	MW-49 MW-39S Dup	MW-40	MW-40	MW-41	MW-50 MW-41 (Dup	MW-42	MW-42	MW-43	MW-43	MW-44	MW-44	MW-FB
DATE:	1/5/95	1/5/95	1/5/95	1/10/95	1/10/95	1/9/95	1/9/85	1/6/95	1/6/95	1/6/95	1/6/95	1/10/95	1/10/95	1/12/95
pH (std. units)	8.9	7.5	9.0	7.9	7.6	6.6	6.5	8.2	7.5	6.7	7.6	6.6	7.5	5.5
Specific Conductance (µ	2700	630	2900	2500	2000	490	470	1600	640	620	490	640	510	2
Cyanide, Total	0.64	0.07	0.54	0.87	0.70	0.04	0.04	0.45	0.04	0.02	<0.01	0.02	<0.01	<0.01**
Cyanide, Amenable	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Fluoride	59	3.9	55	40	16	0.2	0.2	22	3.6	0.3	0.9	0.6	0.2	<0.1
Arsenic	<0.004	<0.004	<0.004	<0.004	<0.004	0.017	0.016	<0.004	<0.004	0.01	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	0.36	0.06	0.42	0.36	0.29	8.9	8.6	0.2	0.08	12	0.04	<0.04	<0.04	<0.04
Manganese	0.22	0.87	0.20	0.33	0.74	1.3	1.2	0.35	1.5	8.6	0.64	0.93	<0.01	<0.01
Sodium	520	36	540	470	340	22	21	280	31	47	23	46	23	<0.5
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

* = Elevated detection limit for vanadium due to matrix interference.

** = This sample was reanalyzed fifteen (15) days after the date of collection with the result shown above.

NOTE: All results in mg/L unless otherwise noted.



HMI
Environmental Consulting Services

HYDROSYSTEMS MANAGEMENT, INC.

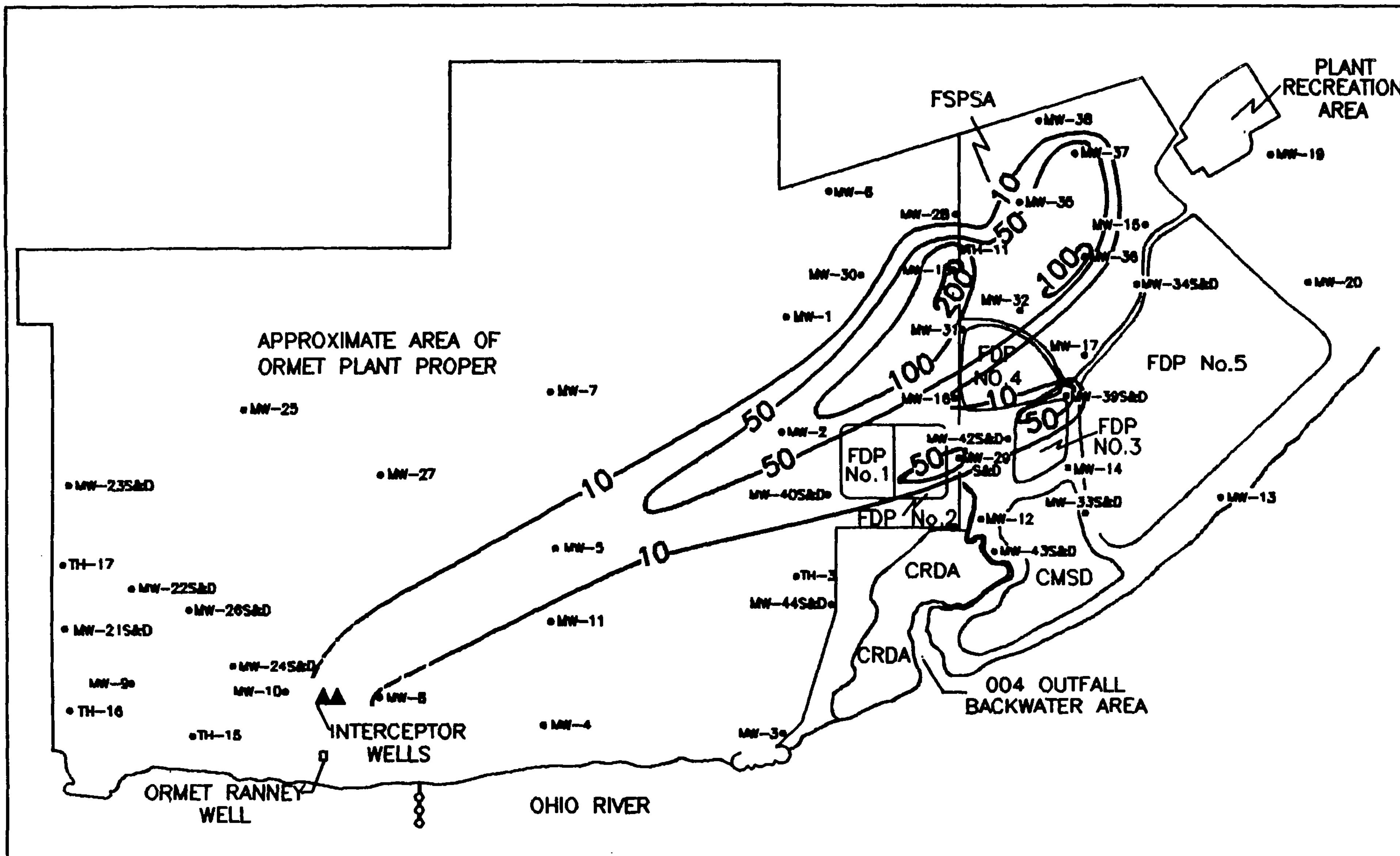
GENERALIZED TOTAL CYANIDE ISOPLETH MAP FOR THE ALLUVIAL AQUIFER
(BASED ON SAMPLES COLLECTED JANUARY 5 - 12, 1995)

ORMET CORPORATION

HANNIBAL OHIO

FIGURE

C-1



HMI Environmental Consulting Services

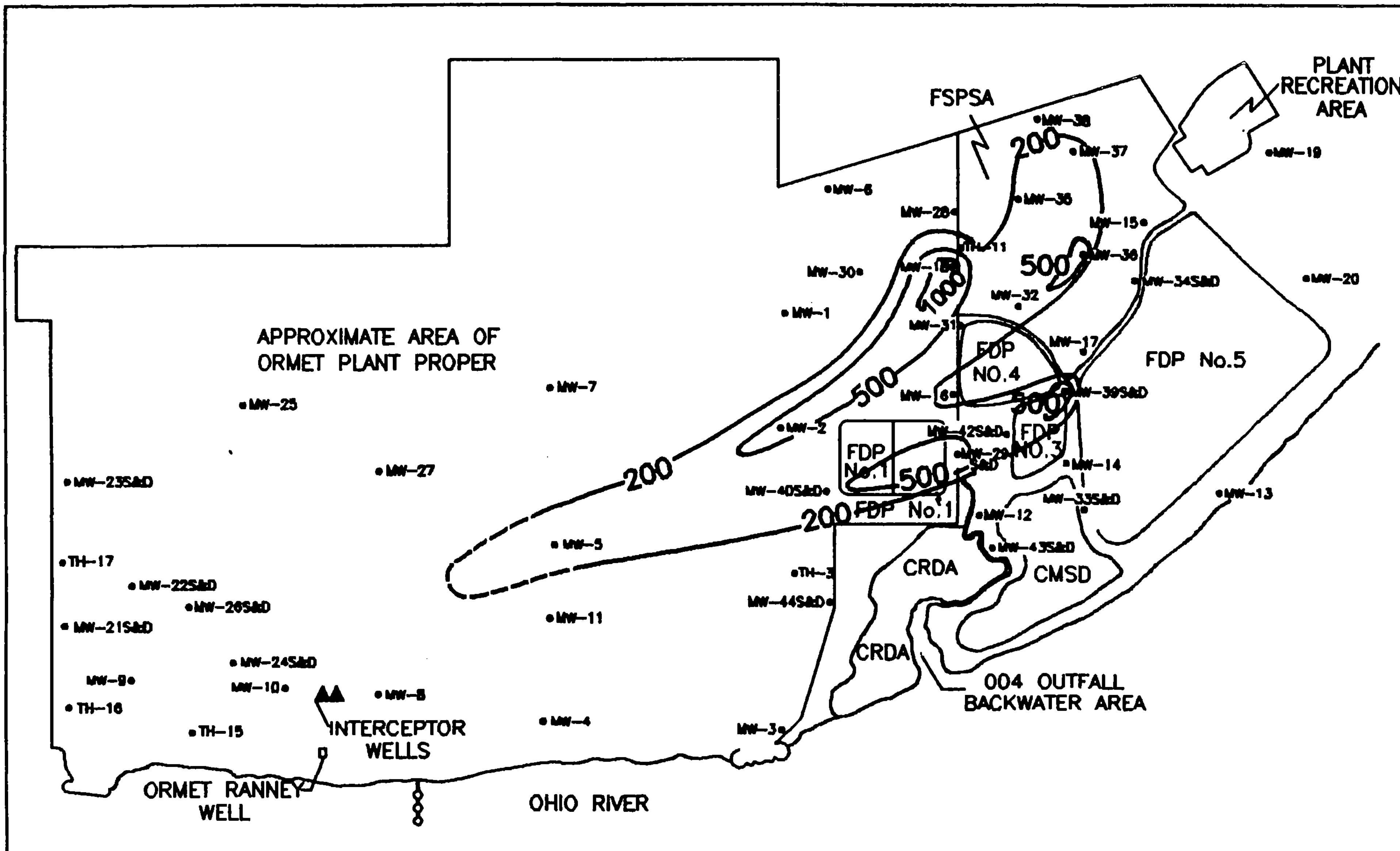
HYDROSYSTEMS MANAGEMENT, INC.

GENERALIZED FLUORIDE ISOPLETH MAP FOR THE ALLUVIAL AQUIFER
(BASED ON SAMPLES COLLECTED JANUARY 5 - 12,1995)

ORMET CORPORATION

HANNIBAL OHIO

FIGURE C-2



HMI — Environmental Consulting Services

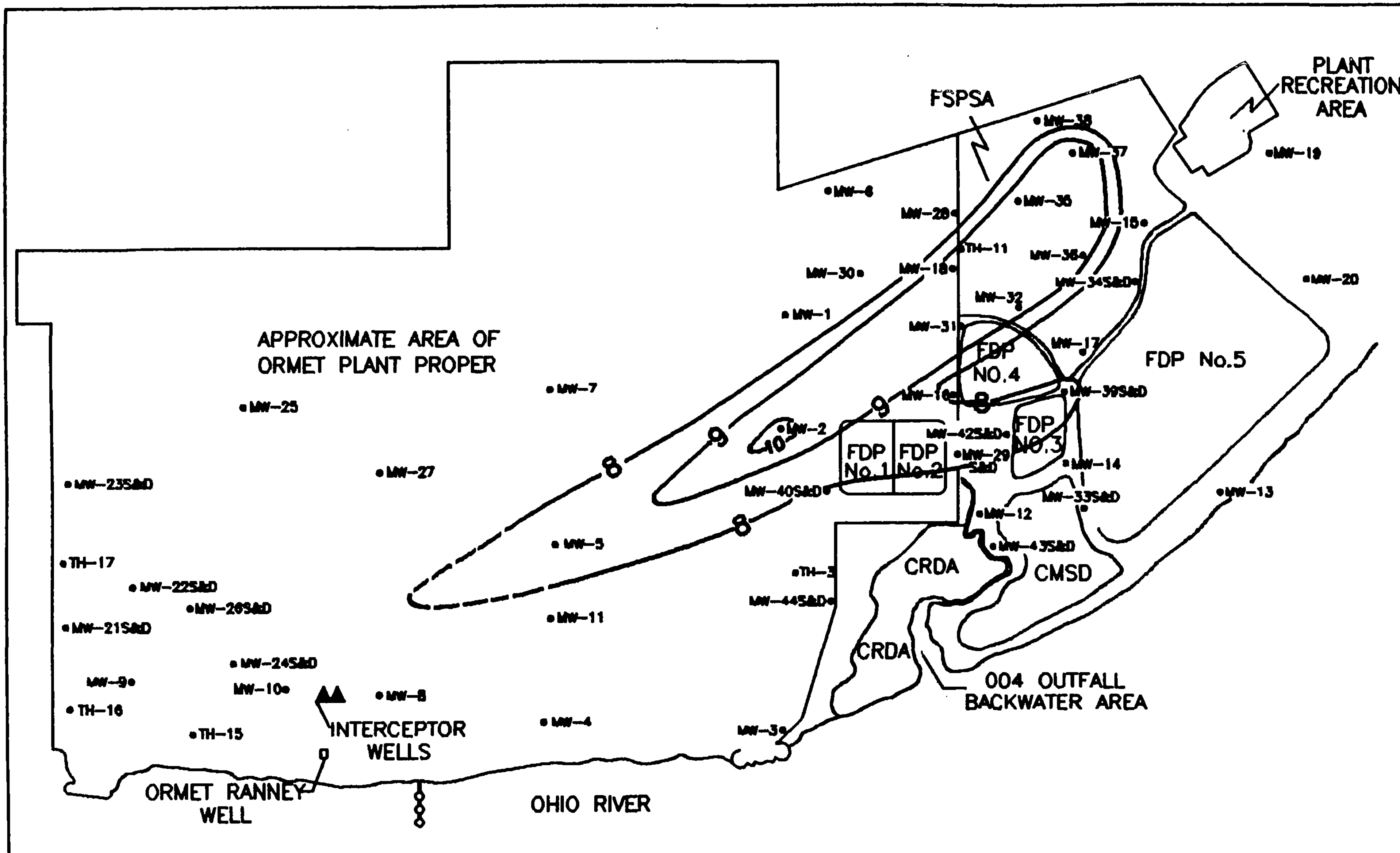
HYDROSYSTEMS MANAGEMENT, INC.

GENERALIZED SODIUM ISOPLETH MAP FOR THE ALLUVIAL AQUIFER
(BASED ON SAMPLES COLLECTED JANUARY 5 - 12, 1995)

ORMET CORPORATION

HANNIBAL OHIO

FIGURE C-3



HMI Environmental Consulting Services

HYDROSYSTEMS MANAGEMENT, INC.

GENERALIZED pH ISOPLETH MAP FOR THE ALLUVIAL AQUIFER
(BASED ON SAMPLES COLLECTED JANUARY 5 - 12,1995)

ORMET CORPORATION

HANNIBAL OHIO

FIGURE C-4

APPENDIX D

ESTIMATION OF DISSOLVED CONTAMINANT MASS-IN-PLACE

APPENDIX D

ESTIMATION OF DISSOLVED CONTAMINANT MASS-IN-PLACE

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE HANNIBAL, OHIO

Section II.3.C. of the SOW specifies that evaluations of aquifer restoration progress are to include calculation of contaminant mass-in-place trends. As a baseline for evaluating future mass removal and mass-in-place data, an estimate will be made of the current contaminant mass in the alluvial aquifer beneath the site. The evaluation will be performed in general conformance with the methods described in the U.S. EPA guidance manual *Methods for Monitoring Pump-and-Treat Performance* (July 1994).

The ROD established remediation standards for seven parameters in ground water, including cyanide, fluoride, arsenic, beryllium, manganese, vanadium, and tetrachloroethene. Of these, cyanide and fluoride are considered to be the primary plume indicators. The remaining parameters show some association with the plume, but do not occur throughout the plume at concentrations over the respective remediation standards. Therefore, cyanide and fluoride will be used as the main indicators for evaluating aquifer restoration progress, as these parameters will provide the most conservative indication of the degree and extent of aquifer restoration. Estimates of current mass-in-place and future evaluations of mass removal rates and mass-in-place trends will be made for cyanide and fluoride, the primary plume indicators.

Estimations of the mass of cyanide and fluoride currently in the alluvial aquifer will be made using data from the sitewide ground-water monitoring event conducted by Ormet in January 1995. These data are the most recent data available for the site. Analytical results for the January 1995 monitoring event are provided in Table D-1. Water-level data are presented in Table D-2.

The analytical results for cyanide and fluoride for January 1995 will be used to construct plume isopleth maps. These maps, in conjunction with background information regarding aquifer thicknesses and assumptions regarding aquifer matrix porosity, will be the basis for the mass-in-place estimates. First, the area (in square feet) of each contour interval will be determined. The volume of the aquifer represented by each contour interval will then be calculated by multiplying the area of each contour interval by the average saturated thickness of the aquifer (determined using recent water-level data), as determined by water-level data for monitoring wells within and/or adjacent to that interval. The volume of ground water within each contour interval will be estimated by multiplying the volume of the aquifer by the assumed porosity. As reported in the RI Report, the aquifer beneath the Ormet site is comprised predominantly of sand and gravel, with a somewhat higher proportion of fine-grained sediment (i.e., silt and/or clay) beneath portions of the FSPSA. The porosity for mixtures of sand and gravel typically range from 10% to 35% (Bouwer 1978, Driscoll 1986, Fetter 1988). Therefore, an average porosity of 25% will be used in the mass-in-place estimates.

Once the volume of ground water corresponding to each contour interval has been estimated, the mass of contaminant within each interval will be calculated by multiplying the ground-water volume by the average constituent concentration for that interval. In most cases, the average concentration for an interval will be assumed to be the midpoint between the two contour values forming the interval. For example, the zone between the 5 mg/L and 10 mg/L contour lines will be assumed to have an average concentration of 7.5 mg/L. For the highest contour interval, the average constituent concentration will be determined using the concentrations for each well located within that contour line. In cases where a contour line is drawn around a single point, the average concentration will be assumed to be the average between the contour value and the constituent concentration reported for the well located within the contour line. For example, if a 100 mg/L contour line is drawn around a single monitoring well with a constituent concentration of 140 mg/L, the average concentration for that interval would be assumed to be 120 mg/L. The mass of contaminant estimated for each contour interval will then be summed to obtain an estimate of the total mass of contaminant within the plume.

REFERENCES

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Driscoll, F.G., 1986. Groundwater and Wells, Second Ed. Johnson Division, St. Paul, MN. p. 67.

Fetter, C.W., 1988. Applied Hydrogeology, Second Ed. Merrill Publishing Company, Columbus, OH. p.68.

U.S. Environmental Protection Agency (U.S. EPA), *Methods for Monitoring Pump-and-Treat Performance*, Office of Research and Development, Washington, D.C. EPA/600/R-94/1223 June 1994.

T..BLE D-1
ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES
COLLECTED JANUARY 5-12, 1995

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

SAMPLE I.D.: DATE:	MW-1 1/9/95	MW-2 1/11/95	MW-3 1/10/95	MW-4 1/10/95	MW-5 1/10/95	MW-7 1/10/95	MW-8 1/10/95	MW-9 1/12/95	MW-10 1/12/95	MW-11 1/10/95	MW-12 1/6/95	MW-13 1/6/95
pH (std. units)	6.2	10.0	6.0	6.9	8.6	5.5	7.8	6.9	7.0	7.6	7.4	7.1
Specific Conductance (µ	370	2400	620	590	1500	850	610	800	800	540	530	490
Cyanide, Total	0.02	7.1	0.62	<0.01	3.1	<0.01	0.09	0.02	0.02	0.02	<0.01	0.02
Cyanide, Amenable	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.01
Fluoride	0.1	93	0.3	1.4	32	0.2	3.1	1.7	0.5	2.3	1.1	0.5
Arsenic	<0.004	0.085	<0.004	<0.004	0.008	0.040	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.04	8.6	1.4	<0.04	1.3	22	<0.04	0.05	<0.04	<0.04	<0.04	2
Manganese	0.39	0.82	1.4	6.8	0.27	2.3	0.08	<0.01	<0.01	0.40	1.5	2.9
Sodium	21	520	46	29	270	72	50	15	26	30	23	23
Vanadium	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

SAMPLE I.D.: DATE:	MW-14 1/6/95	MW-15 1/5/95	MW-16 1/9/95	MW-17 1/5/95	MW-18 1/9/95	MW-46 MW-18 Dup. 1/9/95	MW-19 1/6/95	MW-20 1/9/95	MW-21S 1/12/95	MW-21D 1/12/95	MW-22S 1/11/95	MW-22D 1/11/95
pH (std. units)	7.6	7.0	7.7	7.5	9.6	9.5	7.3	7.0	7.0	6.9	7.3	7.4
Specific Conductance (µ	530	720	850	710	5900	570	630	520	920	870	860	810
Cyanide, Total	0.06	0.49	1.4	0.64	15	12	<0.01	0.05	0.02	0.02	<0.01	<0.01
Cyanide, Amenable	<0.01	0.12	0.13	<0.01	6.6	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01
Fluoride	2.1	1.4	7.9	3.9	290	290	1.0	0.8	0.2	0.3	0.1	0.2
Arsenic	<0.004	<0.004	<0.004	<0.004	0.062	0.053	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	0.08	0.26	0.52	0.26	56	56	0.09	<0.04	<0.04	<0.04	<0.04	<0.04
Manganese	0.74	<0.01	1.1	1.9	0.22	0.24	<0.01	1.5	<0.01	0.02	<0.01	<0.01
Sodium	29	45	81	36	1500	1400	24	26	15	12	29	30
Vanadium	<0.01	<0.01	<0.01	<0.01	0.02*	<0.02*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

* = Elevated detection limit for vanadium due to matrix interference.
NOTE: All results in mg/L unless otherwise noted.

TABLE D-1
ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES
COLLECTED JANUARY 5-12, 1995

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

SAMPLE I.D.: DATE:	MW-23S 1/11/95	MW-23D 1/11/95	MW-24S 1/11/95	MW-24D 1/11/95	MW-25 1/11/95	MW-26S 1/11/95	MW-26D 1/11/95	MW-27 1/11/95	MW-28 1/9/95	MW-29S 1/9/95	MW-29D 1/9/95	MW-30 1/9/95
pH (std. units)	7.4	7.2	7.1	7.1	6.2	7.3	7.3	6.3	6.2	8.3	7.5	6.2
Specific Conductance (µr	870	820	860	870	560	800	760	1300	500	2900	650	430
Cyanide, Total	0.06	<0.01	<0.01	<0.01	0.18	<0.01	<0.01	0.06	0.74	0.79	0.22	0.01
Cyanide, Amenable	0.05	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	0.26	0.07	0.03	<0.01
Fluoride	0.7	1.3	0.6	1.3	0.1	0.1	0.2	0.4	2.7	56	3.7	<0.1
Arsenic	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	<0.04	<0.04	<0.04	<0.04	0.10	<0.04	<0.04	0.96	0.38	0.37	0.09	0.78
Manganese	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	0.02	0.12	2.0	0.60
Sodium	24	28	26	24	34	31	27	160	79	590	33	19
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

SAMPLE I.D.: DATE:	MW-31 1/9/95	MW-32 1/5/95	MW-33S 1/6/95	MW-33D 1/6/95	MW-34S 1/5/95	MW-47 (MW-34s D 1/5/95	MW-34D 1/5/95	MW-35 1/5/95	MW-48 MW-35 Dup 1/5/94	MW-36 1/5/95	MW-37 1/5/95	MW-38 1/5/95
pH (std. units)	9.6	9.4	6.8	7.1	7.2	7.1	7.3	9.5	9.5	9.8	9.1	6.4
Specific Conductance (µr	1900	1300	630	560	700	720	640	1200	1100	3500	1200	190
Cyanide, Total	7.1	12	<0.01	<0.01	0.03	0.03	0.07	16	17	18	18	<0.01
Cyanide, Amenable	<0.01	3.6	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	89	47	1.9	1.1	7.3	6.4	4.2	35	51	160	87	0.1
Arsenic	0.027	0.014	<0.004	<0.004	<0.004	<0.004	<0.004	0.018	0.017	0.034	0.033	0.009
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	4.6	2.7	0.12	<0.04	0.18	0.06	<0.04	11	11	8.7	8.5	1.1
Manganese	0.66	0.37	2	6.3	0.01	<0.01	0.82	0.43	0.47	0.83	0.58	0.23
Sodium	420	230	33	28	35	37	34	220	230	770	280	11
Vanadium	<0.02*	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.01	<0.01

* = Elevated detection limit for vanadium due to matrix interference.
NOTE: All results in mg/L unless otherwise noted.

TABLE D-1
ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES
COLLECTED JANUARY 5-12, 1995

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

SAMPLE I.D.:	MW-39S	MW-39D	MW-49 MW-39S Dup	MW-40	MW-40	MW-41	MW-50 MW-41 (Dup	MW-42	MW-42	MW-43	MW-43	MW-44	MW-44	MW-FB
DATE:	1/5/95	1/5/95	1/5/95	1/10/95	1/10/95	1/9/95	1/9/85	1/6/95	1/6/95	1/6/95	1/6/95	1/10/95	1/10/95	1/12/95
pH (std. units)	8.9	7.5	9.0	7.9	7.6	6.6	6.5	8.2	7.5	6.7	7.6	6.6	7.5	5.5
Specific Conductance (µ	2700	630	2900	2500	2000	490	470	1600	640	620	490	640	510	2
Cyanide, Total	0.64	0.07	0.54	0.87	0.70	0.04	0.04	0.45	0.04	0.02	<0.01	0.02	<0.01	<0.01**
Cyanide, Amenable	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Fluoride	59	3.9	55	40	16	0.2	0.2	22	3.6	0.3	0.9	0.6	0.2	<0.1
Arsenic	<0.004	<0.004	<0.004	<0.004	<0.004	0.017	0.016	<0.004	<0.004	0.01	<0.004	<0.004	<0.004	<0.004
Beryllium	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	0.36	0.06	0.42	0.36	0.29	8.9	8.6	0.2	0.08	12	0.04	<0.04	<0.04	<0.04
Manganese	0.22	0.87	0.20	0.33	0.74	1.3	1.2	0.35	1.5	8.6	0.64	0.93	<0.01	<0.01
Sodium	520	36	540	470	340	22	21	280	31	47	23	46	23	<0.5
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

* = Elevated detection limit for vanadium due to matrix interference.

** = This sample was reanalyzed fifteen (15) days after the date of collection with the result shown above.

NOTE: All results in mg/L unless otherwise noted.

TABLE D-2

WATER-LEVEL ELEVATION DATA

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

DATE: January 4, 1995

WATER-LEVEL MEASURING POINT	MEASURING POINT ELEVATION (ft. MSL)	DEPTH TO WATER (feet)	GROUND-WATER ELEVATION (ft. MSL)
MW-1	668.07	54.59	613.48
MW-2	668.12	56.86	611.26
MW-3	645.17	29.25	615.92
MW-4	661.07	57.02	604.05
MW-5	668.16	62.84	605.32
MW-7	667.94	58.97	608.97
MW-8	667.71	68.06	599.65
MW-9	666.59	65.81	600.78
MW-10	667.16	67.66	599.50
MW-11	667.31	62.67	604.64
MW-12	636.73	22.54	614.19
MW-13	661.44	41.75	619.69
MW-14	653.59	37.49	616.10
MW-15	657.31	37.77	619.54
MW-16	662.72	48.20	614.52
MW-17	655.03	37.27	617.76
MW-18	660.91	39.91	621.00
MW-19	662.03	41.55	620.48
MW-20	632.33	12.04	620.29
MW-21s	664.02	62.59	601.43
MW-21d	663.60	62.18	601.42
MW-22s	667.47	66.50	600.97
MW-22d	667.21	66.27	600.94
MW-23s	663.18	61.42	601.76
MW-23d	663.41	61.79	601.62
MW-24s	667.88	67.81	600.07
MW-24d	667.75	67.72	600.03
MW-25	667.73	64.30	603.43
MW-26s	665.54	65.03	600.51
MW-26d	665.59	65.16	600.43
MW-27	667.86	64.34	603.52
MW-28	663.27	22.15	641.12
MW-29s	653.40	39.27	614.13
MW-29d	653.07	38.88	614.19
MW-30	667.58	49.34	618.24
MW-31	661.59	46.27	615.32
MW-32	656.66	39.62	617.04
MW-33s	653.24	35.05	618.19
MW-33d	653.22	36.32	616.90
MW-34s	655.67	36.62	619.05
MW-34d	654.67	35.55	619.12
MW-35	661.90	36.52	625.38
MW-36	655.14	36.51	618.63
MW-37	661.14	21.01	640.13
MW-38	666.64	20.94	645.70

TABLE D-2

WATER-LEVEL ELEVATION DATA

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

DATE: January 4, 1995

MW-39s	657.30	40.64	616.66
MW-39d	657.18	40.24	616.94
MW-40s	662.22	50.80	611.42
MW-40d	661.95	50.57	611.38
MW-41	637.67	13.53	624.14
MW-42s	654.37	39.39	614.98
MW-42d	654.34	39.26	615.08
MW-43s	633.68	19.16	614.52
MW-43d	633.12	18.62	614.50
MW-44s	662.01	50.92	611.09
MW-44d	661.76	51.44	610.32
PPB-01*	663.24	22.04	641.20
PPB-02s*	663.14	17.45	645.69
PPB-02d+	662.78	43.24	619.54
PPB-04+	661.57	45.07	616.50
PPB-05*	661.62	20.90	640.72
PPB-06+	663.04	45.00	618.04
PPB-07*	661.71	Not Found	---
PPB-09+	664.30	43.42	620.88
PPB-10*	663.45	15.78	647.67
PPB-14*	660.64	33.54	627.10
TH-3	667.81	57.74	610.07
TH-10	658.17	38.02	620.15
TH-11	659.08	37.10	621.98
TH-15	663.62	63.37	600.25
TH-16	664.62	63.35	601.27
TH-17	663.93	62.39	601.54
RP-1	643.17	19.03	624.14
RP-2	643.05	19.36	623.69
EAST INT.	667.30	Not Accessible	---
WEST INT.	667.46	Not Accessible	---
A		59.54	
B		57.62	
C		44.97	
D		26.99	
E		5.06	
F		15.10	
G		7.52	

NOTE:
All MW-series wells are measured from the top of the PVC casing.
All TH-series wells are measured from the top of steel casing.
River pool (RP) measuring points are located on the walkway below the dry scrubbers.
East INT & WEST INT refer to the old interceptor wells near the Ormet Ranney well.

* - Designates a perched zone piezometer
+ - Designates an alluvial aquifer piezometer.

APPENDIX E

FSPSA SOIL TREATABILITY STUDY WORK PLAN

APPENDIX E

FSPSA SOIL FLUSHING WORK PLAN

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE HANNIBAL, OHIO

1.0 INTRODUCTION

Soil flushing was selected for remediation of soil in the Former Spent Potliner Storage Area (FSPSA). This work plan describes a treatability study to be performed during the pre-design stage of the Remedial Design to support the design of the soil flushing system and to estimate soil constituent levels hypothetically needed to achieve Ground Water Cleanup Standards.

1.1 BACKGROUND

During the period of 1958 to 1968, spent potliner was placed in two separate piles located north and south of an unpaved access road. Approximately 85,000 tons of potliner were placed in the area for storage. During 1968 to 1981, Ormet Primary used an onsite cryolite-recovery plant to process spent potliner that was being generated by manufacturing operations. During 1968 to 1981, Ormet Primary used construction equipment to load spent potliner from the FSPSA into trucks for transport to the cryolite-recovery plant. While spent potliner in the FSPSA was removed, a small portion of the spent potliner material was broken and crushed during handling by construction equipment and has been mixed into the underlying soil. As previously discussed, shallow soil within the FSPSA is the predominant source of ground water alterations in the alluvial aquifer.

1.2 SITE CONDITIONS

Based upon information developed during the RI, the generalized stratigraphy beneath the approximately 10-acre FSPSA consists of three general strata; fill material, which is underlain by sand and gravel, which is underlain by bedrock. The granular fill layer is present at the ground surface over much of the area, and ranges in thickness up to 4 feet. The thickness of the underlying sand and gravel stratum ranges from approximately 30 feet at the northern edge of the FSPSA, to approximately 60 feet at the southern edge. In addition, there are interbedded layers of clay and silt present within the stratum, predominantly beneath the northern portion of the FSPSA. The sand and gravel stratum forms the matrix of a relatively transmissive aquifer. The depth to ground water beneath the FSPSA ranges from approximately 15 feet along the northern edge of the FSPSA to approximately 35 feet throughout the remainder of the area. The ground water is recharged by precipitation that falls on the FSPSA (approximately 25 percent of the 39-inch average annual rainfall is believed to infiltrate through the site), as well as lateral ground water inflow from the north and east.

Sampling performed during the RI indicates that soil samples, collected from 0 to 10 feet below the ground surface, exhibited cyanide, ammonia-nitrogen, fluoride, calcium and sodium levels above the local background levels. The levels of these constituents were generally highest near the surface and decreased with depth. Concentrations of semi-volatile organic compounds, predominantly polynuclear aromatic hydrocarbons (PAHs), were identified in soil samples from four selected locations during the RI. No pesticides or PCBs were identified in the soil samples, and only low levels of VOCs (limited to constituents that are common analytical laboratory contaminants) were identified in the samples from the selected locations.

Based upon an assessment of hydrogeologic conditions, soil constituent levels, and ground water constituent levels, the FSPSA was determined to be the predominant source of the ground water plume identified at the site. The ground water alterations are attributed to the vertical migration of soluble inorganic constituents by precipitation, through the sand and gravel formation, to the underlying aquifer. This, combined with the observation that ground water constituent levels were decreasing following removal of the potliner and flushing by precipitation, lead to the selection of in-situ soil flushing as the remedy for the FSPSA. It is currently estimated that approximately 25 percent of the precipitation that falls at the site (equivalent to approximately 10 inches per year) infiltrates through the soil to the ground water. The proposed remedy will eliminate run-off and supply approximately 120 inches of water for infiltration from March through November each year, increasing the overall infiltration rate approximately 10 times.

The effectiveness of the flushing activities will be evaluated using the results of ground water monitoring performed as part of the Operations and Maintenance activities. However, EPA also desires to establish cleanup standards for the FSPSA soil in order to provide an additional measure for evaluation of system performance.

2.0 STUDY OBJECTIVES

The objectives of the treatability study are to 1) gather data to support the design of the soil flushing system and 2) to estimate soil constituent levels hypothetically needed to achieve Ground Water Cleanup Standards. Due to the absence of tetrachloroethene (the only VOC with a Ground Water Cleanup Standard) in the RI soil samples and Ormet Primary's intention to cover the FSPSA soils with a vegetative cover layer (thus eliminating the potential for personnel exposure to PAHs), the study will address the inorganic compounds with established cleanup standards (arsenic, beryllium, cyanide, manganese, vanadium, and fluoride), which are listed in Table E-1.

3.0 METHODOLOGY

A bench scale treatability study will be performed to support design of the system and to evaluate soil flushing performance. The study will be performed in a laboratory using soil samples collected from within the FSPSA and using water from the Ormet Primary Ranney well system as the soil flushing agent. Recent water quality data of the Ranney well system are listed in Table E-2.

The bench scale flushing simulation will be performed using a two-phased approach. For the first phase of the study, a composite soil sample will be analyzed to evaluate the approximate number of flushes needed to achieve the established Ground Water Cleanup Standards for each constituent. For the second phase of the study, portions of the composite soil sample will be analyzed to determine the levels of various constituents remaining in the soil when the leachate meets the corresponding Ground Water Cleanup Standards. The corresponding soil concentrations will represent hypothetical soil levels that will be used in the future in conjunction with ground water monitoring data to ascertain when the soil flushing operation can cease.

3.1 SOIL SAMPLING

Both phases of the study will be performed using a composite soil sample collected from the FSPSA. A sample volume of approximately 6 gallons will be needed. The composite sample will be created by collecting equal volumes (approximately 2 gallons each) of material from three different locations in the FSPSA. At each of the three locations, the aliquot will consist of approximately equal portions of material representative of the fill material (uppermost 0-2 feet) and material representative of the underlying natural soils. Because of the heterogeneous constituent distributions of cyanide and fluoride, the two primary inorganics of concern, separate aliquots will be collected from the three different areas shown in Figure E-1. The sampling locations correspond to the locations established in the RI that yielded elevated levels of each constituent, namely, SB-006 (cyanide) and SB-007 (fluoride). A third location, SB-010, will be sampled to represent conditions where both inorganic constituents are elevated.

The aliquots will be collected from equal portions of the upper 2 feet at each location (fill material) and material representative of the underlying natural soils. Soil will be shoveled into the same container at each location using pre-cleaned and decontaminated tools. Because a composite sample will be made from the three locations, it will not be necessary to decontaminate the sampling tools between sample aliquots. The composite sample will be homogenized by mixing the sampled material in the container.

3.2 WATER SAMPLING

Four, one-liter (L) containers of well water from the Ormet Primary Ranney system will be collected into pre-cleaned laboratory containers. The samples will be collected at the sampling port located in the pump-room, after the discharge line has been flushed for a minimum of 5 minutes. The sample containers will be filled directly from the tap. The pH of the water will be measured and documented in the field. Each sample will be labeled and stored in coolers for transport to the laboratory.

3.3 FIRST PHASE BENCH SCALE FLUSHING

An initial sample of the composite soil and water will be submitted to the analytical laboratory for analysis of the constituents listed in the Table E-1. Analytical methods are included in the table. This initial testing will establish baseline conditions for comparison with data from the flushing simulations.

The first phase bench scale flushing will be performed as follows:

- A 3000 cubic centimeter (cc) soil sample will be placed in a Pyrex 3000 ml Buchner funnel with a Porosity C coarse fritted disk. Five 500 milliliter (ml) aliquots of water from the Ormet Primary well will be leached by gravity through the soil column. The leachate will be collected from the first, third, and fifth aliquot applications and submitted to the analytical laboratory for chemical testing of the Table E-1 constituents. The pH of the leachate will be monitored for each aliquot.

- The results of the leachate analyses will be compared to the established Ground Water Cleanup Standards. If all constituent concentrations are below the cleanup standards, the first phase study will be considered complete. If any constituent concentrations continue to exceed the corresponding cleanup standards even after the fifth aliquot application, additional aliquots of water will be added to the soil column and the resulting leachate analyzed until such time that all constituent concentrations are below the cleanup standards.
- Upon completion of the first phase flushing simulation, the soil sample will be removed from the Buchner funnel and reanalyzed for the inorganic constituents listed in Table E-1.

3.4 SECOND PHASE BENCH SCALE FLUSHING

The second phase of the study will involve analyzing portions of the soil sample to evaluate the various soil constituent levels corresponding to the various Ground Water Cleanup Standards. The flushing simulation will be performed in a similar manner to that performed during the first phase, except that a series of up to six samples (depending upon the approximate number of flushes needed to achieve the cleanup standards for six different constituents) will be prepared for analysis. Aliquots of water will be added to each sample corresponding to the estimated number of flushes required to achieve the particular Ground Water Cleanup Standard. At that time, the leachate corresponding to the last flush and the soil from the column will be submitted for analysis of the constituents of concern.

As an example, the first phase test may show that total cyanide levels in the leachate are at or below the Ground Water Cleanup Standard after 3 flushes, whereas the fluoride levels in the leachate are not below the Ground Water Cleanup Standard until 5 flushes. In this example, a second phase test would be set up to run 3 flushes through a given soil sample and then analyzed (soil and leachate) for all Table E-1 constituents. This testing would be expected to show that the cyanide leachate levels were at or below the cyanide Ground Water Cleanup Standard, and would establish a corresponding total cyanide level in the soil. Further, it would be expected that the fluoride leachate levels would still be greater that the corresponding cleanup standard. Also during the second phase, a test would be run with 5 flushes through a separate soil sample, followed by analysis (soil and leachate) for all Table E-1 constituents. This testing would be expected to show that the fluoride levels were now at or below the fluoride Ground Water Cleanup Standard, and would establish a corresponding fluoride level in the soil.

The number of tests to be performed will depend upon the number of unique flushes per constituent determined from the first phase test.

Each individual second phase leaching test will be performed as follows.

- A 3000 cubic centimeter (cc) soil sample will be placed in a Pyrex 3000 ml Buchner funnel with a Porosity C coarse fritted disk. Aliquots of water from the Ormet Primary well will be applied in 500 ml doses for leaching by gravity through the soil column. The number of aliquots applied will correspond to the number of flushes estimated during the first phase testing for a particular constituent. A sample of the leachate will be collected following the final aliquot application and submitted to the analytical laboratory for chemical testing of the Table E-1 constituents.

- The results of the leachate analyses will be compared to the established Ground Water Cleanup Standards. If specific constituent concentration is below the corresponding cleanup standards, the leaching test will be considered complete. If the constituent concentration exceeds the corresponding cleanup standard, additional aliquots of water will be added to the soil column and the resulting leachate analyzed until such time that the constituent concentration is below the cleanup standard.

- Upon completion of the second phase flushing simulation, a soil sample will be removed from each Buchner funnel and analyzed for the inorganic constituents listed in Table E-1. A sample from the funnel requiring the greatest number of flushes will also be forwarded to the laboratory for carcinogenic PAH analysis using SW-846 (Final Update II) Method 8270. The analytical results will be used to calculate residual risk associated with exposure to carcinogenic PAH compounds following completion of soil flushing activities. A work plan for this calculation is provided as Appendix I.

4.0 DATA ANALYSIS AND REPORTING

The results of the second phase flushing tests will generate, for each constituent, a soil concentration that hypothetically corresponds to a leachate level that is equal to or less than the Ground Water Cleanup Standards. A single soil concentration will be generated for each constituent. These soil concentrations will be used to establish soil cleanup standards, which will be incorporated in the ROD for the site. The data from the water and soil analyses will also be used to evaluate the future effectiveness and performance of the flushing system.

As described in the Statement of Work, treatment of the FSPSA soils may cease under two different scenarios:

1. When Soil Cleanup Standards are achieved and when all ground water compliance points in and downgradient of the FSPSA achieve Ground Water Cleanup Standards for three consecutive monitoring events, or

2. If Ground Water Cleanup Standards have been achieved in downgradient monitoring wells for three consecutive monitoring events, but Soil Cleanup Standards have not been achieved, Settling Defendant may petition U.S.EPA to terminate soil flushing in the FSPSA.

5.0 SCHEDULE

Commencement of the soil flushing treatability test is scheduled to take place upon approval of the RD/RA Work Plan. The test duration is anticipated to require 6 weeks. The results of the treatability test and residual risk calculations will be included in the Preliminary Design submittal scheduled to be completed within 120 days following work plan approval.

TABLE E-1

INORGANIC CONSTITUENTS OF CONCERN IN THE FSPSA

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE
HANNIBAL, OHIO

Inorganic Constituent	Ground Water Cleanup Standard (µg/L)	Analytical Method
Arsenic	To be defined (1)	6010A (2)
Beryllium	4	7091 (2)
Cyanide, Total	200	335.2 (3)
Manganese	To be defined (1)	6010A (2)
Vanadium	260	6010A (2)
Fluoride	4,000	340.2 (3)

(1) Ground Water Cleanup Standards for manganese and arsenic shall be defined during Remedial Design after consideration of background values.
(2) Analytical methods based on "Test Methods for Evaluating Solid Waste, Physical/Chemical; Methods," U.S. EPA SW-846 (Final Update II) 3rd Edition, November 1990.
(3) Analytical method based on "Methods for Chemical Analysis of Water and Wastes," U.S. EPA, EPA 600/4-79-020, Revised March 1983.

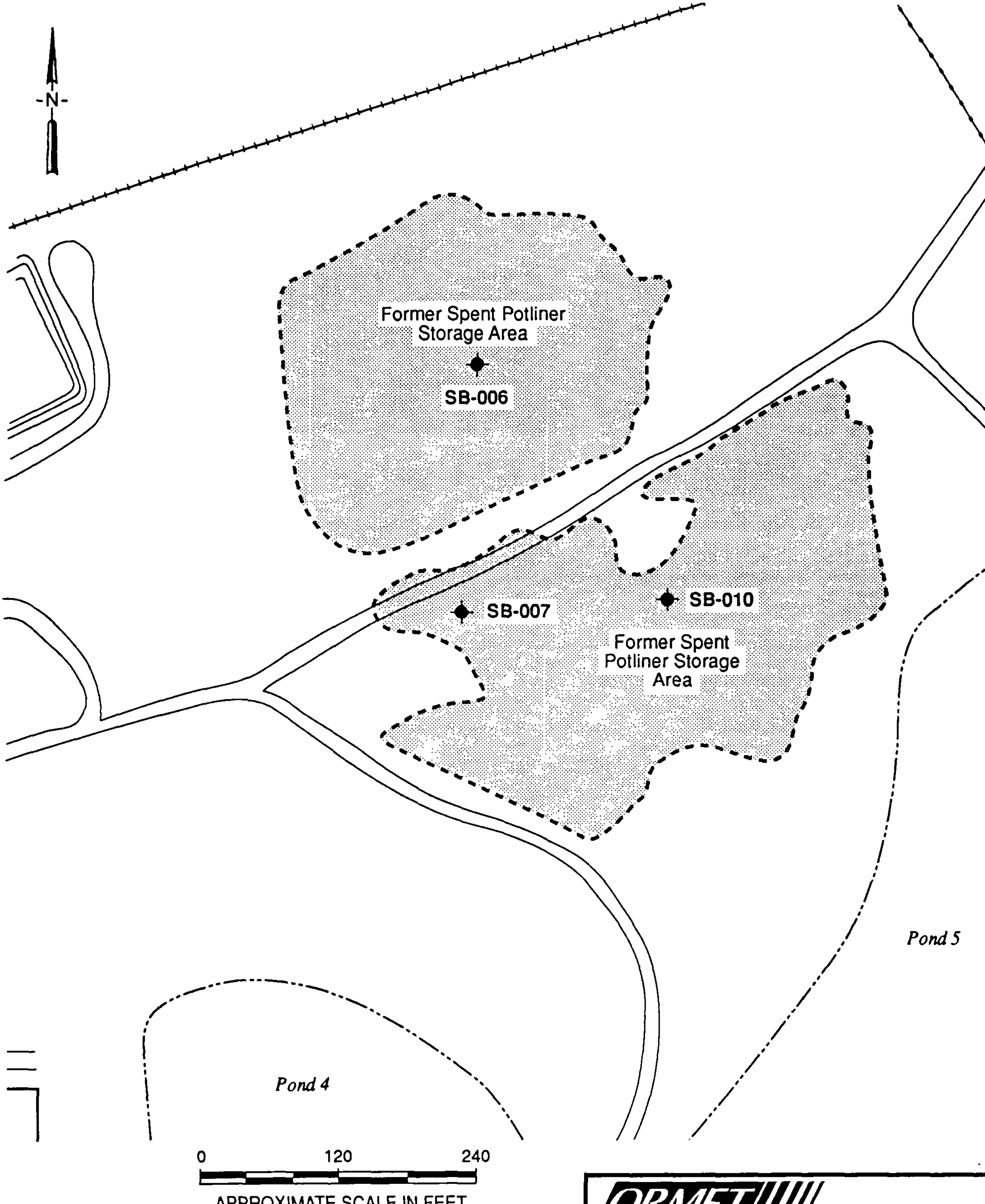
TABLE E-2

ORMET RANNEY WELL ANALYSES
AUGUST 1994 THROUGH AUGUST 1995

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

Parameter	Aug-94	Dec-94	Mar-95	Jun-95	Aug-95
Cyanide, Total (mg/L)	0.10	0.041	0.023	0.066	0.06
Cyanide, Free (mg/L)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride (mg/L)	1.12	1.13	1.27	1.03	1.03
pH (S.U.)	7.84	7.42	7.60	7.51	7.58
TBS (mg/L)	341	350	352	342	332
Aluminum (µg/L)	< 100	< 100	< 100	< 100	< 100
Nickel (µg/L)	45	NA	< 40	NA	NA

NA = No analysis performed
Data provided by Ormet



LEGEND:

Fenceline

Railroad Tracks

SB-007 Proposed Soil Sample Location and Number

ORMET

FIGURE E-1
LOCATION OF PROPOSED SOIL SAMPLES FROM THE FORMER SPENT POTLINER STORAGE AREA

JOB NO. 07983-032-006 Dames & Moore

APPENDIX F

CMSD SEEP TREATABILITY STUDY WORK PLAN

APPENDIX F

CMSD SEEP TREATABILITY WORK PLAN

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE HANNIBAL, OHIO

1.0 INTRODUCTION

One component of the remedial action specified for the Construction Materials Scrap Dump (CMSD) is installation of trench drains to collect water seeping from the CMSD. Water that collects in the drainage sumps will be pumped to a pre-treatment system (likely consisting of an oil separation stage followed by an activated carbon adsorption stage) prior to discharge to the existing wastewater treatment plant. Residuals from the pre-treatment systems (i.e., spent carbon, oil, sediment from the oil/water separator, etc.) will be characterized and disposed in accordance with applicable laws and regulations. This work plan describes a treatability study to evaluate the ability of an oil removal and carbon adsorption system to remove PCBs and achieve other applicable NPDES limits. The treatability study will be performed during the pre-design stage of the Remedial Design.

1.1 BACKGROUND

The CMSD covers an area of approximately 4 to 5 acres on the southeastern portion of the Ormet Primary property, an area that was formerly a terrace above the Ohio River floodplain. Based upon historic topographic information developed prior to construction in this area, the ground surface beneath the CMSD was typically flat to gently sloping, with a pair of drainage channels trending parallel to the Ohio River that discharged into what is now referred to as the Backwater Area. Historic ground surface elevations beneath the CMSD predominantly ranged from approximately 627 to 632 feet. Immediately southeast of the CMSD, the ground sloped steeply to the former Ohio River floodplain, located at elevations ranging from 602 feet (the former Ohio River pool elevation) to 610 feet.

The CMSD operated from approximately 1958 through 1979. During that time, the unit received a variety of material and debris from plant operations. As discussed in the Remedial Investigation (RI), materials that were potentially (but not necessarily) disposed include furnace brick, wooden pallets, petroleum coke fines and anode production scrap, miscellaneous demolition debris, petroleum products, plant trash, discarded electrical components, motor shop wastes, discarded mechanical components, discarded raw materials (e.g., alumina, cryolite, and anode binder pitch), and spent potliner. The materials were typically transported by truck, then dumped and spread over the ground surface. Throughout the period that the CMSD operated, an independent salvage contractor operated at the site to recover recyclable and/or reusable items.

1.2 SITE CONDITIONS

More recent topography (data collected in April 1987) depicting the surface of the CMSD and adjacent areas approximately 8 years following the last use of the CMSD is presented in Figure F-1. Areas located above elevation 660 feet are typically vegetated, with slopes of 5 percent or less. Those below elevation 645 feet to the west, and 600 to the southeast along the river, are predominately wooded and steeply sloped, with grades on the order of 1.5 feet (horizontal) to 1-foot (vertical) or greater. Completion of the Hannibal Locks and Dam in 1975 raised the pool elevation of the Ohio River to 623 feet. As a result, the shoreline of the river moved approximately 50 to 100 feet northwest.

Five seeps were observed along the perimeter of the CMSD at different times during the RI (Seep Nos. 2,3,5,6, and 7). Samples were collected from four of the five seeps (Seep No. 7 was dry) located along the western limit of the CMSD (Figure F-1). The discharge from these seeps flows into the Outfall 004 stream and subsequently to the Backwater Area. The seeps are believed to result from precipitation that has infiltrated through the CMSD, and migrated along the surface of the low permeabilities strata that existed on the upper floodplain prior to construction of the CMSD. This interpretation is supported by results of testing performed during the Remedial Investigation that indicate that representative samples of this strata exhibit vertical permeability predominantly ranging from 1×10^{-7} to 1×10^{-8} cm/sec, which is consistent with current performance requirements for the construction of low permeability soil liner system components for solid and hazardous waste landfills. Excess water that may contact the underlying clay stratum will preferentially migrate along the historic ground surface and discharge to the west. Thus, the natural soil and historic land surface topography act in conjunction to serve as a functional leachate collection system for the CMSD.

Sampling performed during the RI indicates that water samples discharging from the base of the CMSD is characterized by cyanide, fluoride, various other inorganics, and trace levels of a couple of organic compounds, most of which were identified as common analytical laboratory contaminants. Aroclor 1242 was detected in samples from Seep Nos.

2 and 3 with reported concentrations ranging from 0.0036 mg/l to 0.0074 mg/l in Seep No. 2 and 0.00083 mg/l to 0.0023 mg/l in Seep No. 3.

2.0 STUDY OBJECTIVE

The objective of the treatability study is to evaluate whether or not pretreatment through oil/water separation and activated carbon adsorption will reduce the PCB concentrations and achieve other applicable NPDES limits. For the purpose of this study, it is assumed that the other applicable NPDES limits are the Daily Discharge Limitations established for Outfall 004 and/or treatment plant outfall in the Ormet Primary NPDES permit. The constituents and discharge limitations are presented in Table F-1.

3.0 METHODOLOGY

A bench scale treatability study will be performed to meet the objective identified above. The study will be performed using water samples collected from the seeps of interest flowing at the time of the sampling.

The treatability study will be involve two steps: sample collection and analysis, and bench scale testing. Both steps of the study will be performed using composite seep samples formed by combining sample aliquots collected from Seep Nos. 2 and 3. If one of these seeps is not flowing at the time of the sampling, a single seep sample from the flowing seep will be collected and used for the study. If neither seep is flowing at the time of the sampling, the study will be re-scheduled until which time one or both of the subject seeps is flowing.

3.1 SEEP SAMPLE COLLECTION AND ANALYSIS - INITIAL CONDITIONS

Samples of the water from the subject seeps will be collected for oil and grease analysis, PCBs analysis, inorganic constituent analysis, and for subsequent bench scale testing. The sampling and analysis program will attempt to empirically identify the presence of free oil and grease in addition to the presence of dissolved or emulsified oil and grease.

Separate water samples will be collected from Seep Nos. 2 and 3 and composited into one sample or, if one of the two seeps is not flowing, a single location will be sampled. Adequate sampling conditions will be determined by first checking the target seep locations (see Figure F-1). Depending upon field conditions and the rate of flow, preparation may be required, such as digging back into the slope to allow adequate clearance for the sample containers. If the flow rate is very slow, stainless steel pans may be left beneath each seep to collect the necessary volume.

At each location, water flowing from the seep will be collected directly or, if necessary, using stainless steel containers to transfer the sample into sample containers provided by the analytical laboratory. The sample for PCB analysis will be collected first by filling a 1-liter amber glass bottle half full (if both seeps will be sampled) or completely full (if only one seep will be sampled). The bottle will be capped with a Teflon-lined lid.

The sample for oil and grease analysis will be collected next. A total of four, 1-liter bottles will need to the filled. Each 1-liter amber bottle will be filled either halfway or completely full and capped with a Teflon-lined lid.

The samples for inorganic constituent analysis will be collected next. The sample for free cyanide analysis will be collected by filling a 500 ml plastic bottle, either halfway or completely full, and capping the bottle. The sample for total silver, nickel, and aluminum analysis will be collected by filling a 500 ml plastic bottle, either halfway or completely full, and capping the bottle. The sample for fluoride will be collected by filling a 250 ml plastic bottle.

The samples for the subsequent bench scale testing program will be collected last. Six 1-gallon samples will need to be collected. Each 1-gallon amber bottle will be filled either halfway or completely full and capped.

If the second seep location is to be sampled, the eight, half-full 1-liter, 500 ml and 250 ml bottles and six, half-full 1-gallon bottles will be transferred to the second location and filled directly with water from the seep. The bottle for PCB analysis will be labeled and carefully packed in a chilled cooler for storage prior to shipment to the analytical laboratory. The PCB analysis will be performed by the methodology specified by SW-846 (Final Update II), Method 8080. This initial testing will establish baseline conditions for comparison with data from the subsequent bench tests.

Of the four bottles for oil and grease analysis, two samples will be acidified and cooled in accordance with sample preservation techniques specified by EPA Method 413~~.2~~.1. The two remaining samples will be chilled but will not be acidified. All four sample bottles will be properly labeled and carefully packed in a chilled cooler for storage prior to shipment to the analytical laboratory.

After the samples arrive at the analytical laboratory, the acidified samples will be prepared, extracted and analyzed in accordance with EPA Method 413.1.

The chilled samples will be filtered through a 0.45 micron glass filter. The filtrate will be transferred to an extraction flask for analysis for oil and grease by EPA Method 413.1. Residue remaining in the filter flask will not be wiped or otherwise extracted for analysis with the filtrate.

Free oil is suspected to be present in a sample if the level of oil and grease detected in the unacidified and filtered sample is greater than the concentration of oil and grease detected in the acidified and unfiltered sample by more than the standard deviation allowed in EPA Method 413.1.

The sample for free cyanide analysis (500 ml bottle) will be preserved with sodium hydroxide and cooled in accordance with the sample preservation techniques discussed in the *Sampling and Analysis Plan/Quality Assurance Project Plan.* The sample will be analyzed in accordance with the modified microdiffusion method (approved by Ohio EPA). The sample for total silver, aluminum, and nickel analysis will be acid preserved (with nitric acid) and cooled in accordance with the *Sampling and Analysis Plan/Quality Assurance Project Plan.* The total silver, nickel and aluminum sample will be analyzed in accordance with EPA Method 272.2, EPA Method 200.7, and EPA Method 200.7, respectively. The sample for fluoride will be cooled in accordance with the sample preservation techniques discussed in the Sampling and Analysis Plan/Quality Assurance Project Plan. The fluoride sample will be analyzed in accordance with EPA Method 340.2.

The remaining six 1-gallon bottles for the bench scale testing will be packaged and shipped directly to the treatability study entity. The samples will be kept chilled during shipping.

3.2 SEEP SAMPLE BENCH SCALE TESTING

Bench scale testing will be determined based upon screening analysis using the following adsorbents or equivalent products: Calgon KLENSORB 100, Calgon FILTRASORB 400, and Calgon DSR-C 8x30. The testing will be performed after the analytical results from the initial analyses are received.

The six 1-gallon samples will be used for the bench scale testing. Dosing rates will be determined by comparing the initial analytical results to loading rates recommended by the manufacturer for each product. Sample loading rates will be determined based upon the baseline analytical results and manufacturer's recommended loading rates for the specific product.

PYREX/KIMAX Buchner funnels will be used as the dosing columns for the adsorbent. The volume of the Buchner funnel will be sized according to the maximum recommended amount of adsorbent that will be required to treat up to at least one gallon of sample depending upon the typical concentration of oil and grease detected in the baseline analytical results.

The following bench scale tests will be performed contingent upon the suspected presence of free oil which could coat and bind granular activated carbon. Following each test, the filtrate will be tested for oil and grease by EPA Method 413.1, PCBs by Method 8080, free cyanide analysis by the modified microdiffusion method (approved by Ohio EPA), total silver analysis by EPA Method 272.2, fluoride by EPA Method 340.2, nickel by EPA Method 200.7, and aluminum by EPA Method 200.7.

- One sample will be treated by passing the sample through KLENSORB 100
- One sample will be tested by passing the sample through FILTRASORB 400 virgin liquid phase activated carbon (GAC)
- One sample will be tested by passing the sample through DSR-C 8X30 reactivated GAC
- One sample will be tested by passing the sample though virgin GAC and then filtered through the KLENSORB 100
- One sample will be tested by passing the sample through reactivated GAC and then filtered through KLENSORB 100.

4.0 DATA ANALYSIS AND REPORTING

The results of the bench scale treatability tests will generate data to evaluate the removal efficiency of the various treatment configurations. These data will be used in the Design Stage to determine the need for pretreatment to prevent clogging and to estimate carbon loading rates. The results of the treatability study will be presented in the Preliminary Design Submittal.

5.0 SCHEDULE

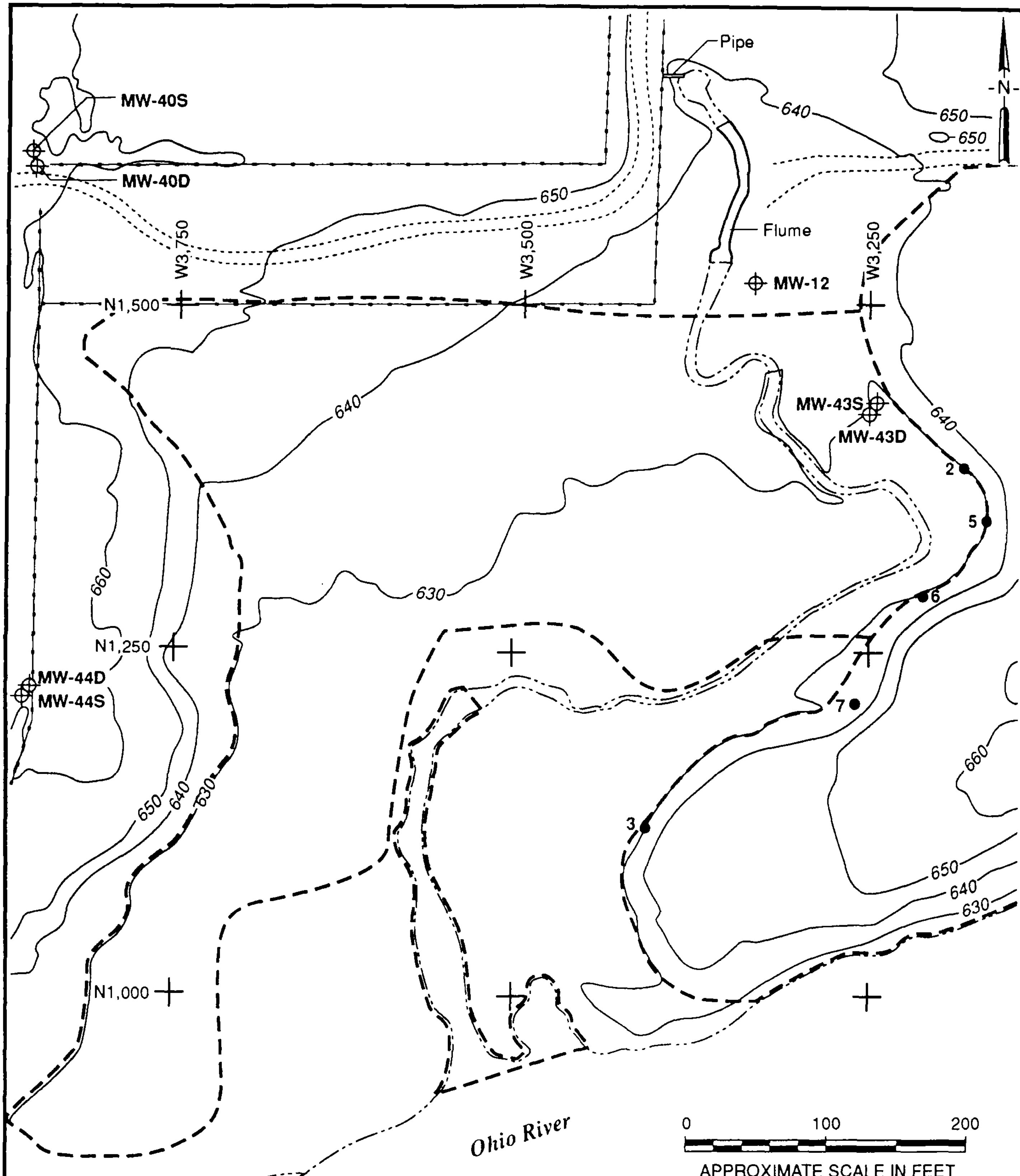
Commencement of the bench scale seep treatability study is scheduled to take place upon approval of the RD/RA Work Plan. The test duration is anticipated to require 8 weeks. The results of the treatability test will be included in the Preliminary Design submittal scheduled to be completed within 120 days following work plan approval.

TABLE F-1

OUTFALL 004 AND GROUND WATER TREATMENT PLANT NPDES LIMITS

ORMET PRIMARY ALUMINUM CORPORATION SUPERFUND SITE HANNIBAL, OHIO

Constituent	Daily Discharge Limit (mg/L)
Outfall 004 Limits	
Oil and Grease, total	20
Silver, total	5.0
Cyanide, free	0.044
Treatment Plant Outfall Limits	
Fluoride, Total	59.5
Nickel, Total	0.549
Aluminum, Total	6.11



LEGEND:

— — —	Approximate Unit Limit
—•—•—	Fence
········	Dirt Roadway
—650—	Topographic Contour
+N1,000	Plant Grid Coordinate
6 ●	Seep Location and Number
⊕ MW-44S	Monitoring Well Location and Number

ORMET

FIGURE F-1
CMSD SEEP LOCATIONS

JOB NO. 07983-032-006

Dames & Moore

ORMET-032 5050-006-REMED DSG WP

APPENDIX G

DATA MANAGEMENT PLAN

APPENDIX G

DATA MANAGEMENT PLAN

ORMET PRIMARY SUPERFUND SITE HANNIBAL, OHIO

1.0 INTRODUCTION

This Data Management Plan has been developed for use in conjunction with the Remedial Design Work Plan for the Ormet Primary Aluminum Corporation Superfund Site in Hannibal, Ohio. The Data Management Plan presents the overall project management systems for Remedial Design Activities, and also describes the procedures for documenting, managing, and reporting investigation data and results.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The primary parties responsible for implementation and approval of the Remedial Design activities are the Ormet Primary Aluminum Corporation (Ormet Primary) and the United States Environmental Protection Agency (U.S. EPA). Information will also be provided to representatives of the Ohio Environmental Protection Agency (OEPA). Each party will provide the resources necessary to implement its responsibilities as outlined in the Consent Decree.

Key personnel in the project organizational structure include:

- Ormet Primary Project Coordinator - The Ormet Primary Project Coordinator is responsible for the overall management and implementation of the various investigations and remedial design. He will utilize qualified contractors, as needed, to implement the remedial design activities.

- U.S. EPA Project Coordinator - The U.S. EPA Project Coordinator is responsible for the overall management and review for all phases of the pre-design and remedial design in ~~coordination with the Ohio Environmental Protection Agency (OEPA).~~

Ormet Primary has retained Dames & Moore, Inc. to serve as the Supervising Contractor for implementation of the Remedial Design. It has also retained Hydrosystems Management, Inc. to provide consulting on hydrogeologic issues relating to the Remedial Design.

3.0 REPORTING PROCEDURES AND DOCUMENTS

The Ormet Primary Project Coordinator is responsible for assuring completion of all reports required for implementation of the Remedial Design. The Ormet Primary Project Coordinator may delegate preparation and submittal of the various reports to other parties, but shall retain overall responsibility for these actions.

Unless specifically noted otherwise, a copy each of all reports required under the Work Plan will be transmitted to the addressees below:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
DJ # 90-11-3-1423
P.O. Box 7611
Washington, DC 20044-7611

~~Director~~
~~Waste Management Division~~
~~U.S. EPA - Region V~~
~~77 West Jackson Blvd.~~
~~Chicago, IL 60604-3590~~

Jennifer L. Wendel
U.S. EPA Project Coordinator
U.S. EPA - Region V
77 West Jackson Blvd., HSRM-6J
Chicago, IL 60604-3590

Kay Gossett
OEPA Project Coordinator
Ohio Environmental Protection Agency
Southeast District Office
2195 Front Street
Logan, OH 43138-9031

A number of reports are required during the Remedial Design and Remedial Action program. In addition to the Remedial Design and Remedial Action reports described in the main body of the Work Plan, there are monthly progress reports and other special notices. Information relating to these reports is presented below. A summary of all the reports anticipated during the Remedial Design and Remedial Action activities is presented in Table G-1.

3.1 PROGRESS REPORTS

Progress reports will be prepared in letter format. At a minimum, the reports will include the following information:

- A description of the actions which have been taken toward achieving compliance with the Consent Decree during the previous month
- A summary of all results of sampling and tests and all other data received or generated by Ormet Primary, or its contractors or agents, in the previous month
- A list of all work plans and other deliverables required by the Consent Decree completed and submitted during the previous month
- A description of all actions which are scheduled for the next six weeks
- Information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule for implementation of the Work, and efforts made to mitigate those delays or anticipated delays
- Identification of proposed work plans or other schedules that have been approved by U.S. EPA
- Description of all activities undertaken in support of the Community Relations Plan during the previous month and those to be undertaken in the next six weeks

Two copies of each progress report will be submitted to the U.S. EPA Project Coordinator and the OEPA Project Coordinator monthly by the fifteenth day of each month, beginning with the month following lodging of the Consent Decree.

3.2 SPECIAL NOTICES

A number of special notices are, or may be, required during implementation of the Remedial Design and Remedial Action activities. These include notices of proposed sample collection activities, reportable spill events, project delays, or disputes between Ormet Primary and U.S. EPA. Information regarding each of these notices is presented below:

3.2.1 Notice of Sample Collection Activity

Ormet Primary will provide at least 28 days advance notice of all sample collection activities performed during the Remedial Design activities, unless shorter notice is agreed to by U.S. EPA.

3.2.2 Spill Reports

In the event that a reportable release as defined under Section 103 of CERCLA or Section 304 of the Emergency Planning and Community Right-to-Know Act occurs during implementation of Remedial Design or Remedial Action activities, in addition to following the requirements established in those statutes, Ormet Primary will orally notify the U.S. EPA Project Coordinator or Alternate U.S. EPA Project Coordinator (or in the event of unavailability, the U.S. EPA Region V Emergency Response Section at 312-886-9295) within 24 hours of the onset of the event. This shall be followed within 20 days following the onset of the event, by a written report setting forth the events which occurred and the measures taken, and to be taken, in response. Within 30 days following conclusion of the event, a report shall be submitted setting forth all actions taken in response to the event. The reports shall be signed by the Ormet Primary Project Coordinator, and be submitted to both the U.S. EPA Project Coordinator and the OEPA Project Coordinator.

3.2.3 Delays/Force Majure

If any event occurs that may delay performance of an event required under the Consent Decree, Ormet Primary will orally notify the U.S. EPA Project Coordinator or Alternate U.S. EPA Project Coordinator (or in the event of unavailability, the Director of the U.S. EPA Region V Superfund Division at 312-886-7579 within 48 hours after Ormet Primary first knows, or should have known, that the event might cause a delay. This shall be followed within 5 days thereafter, by a written report setting forth:

- an explanation and description of reasons for the delay
- the anticipated duration of the delay
- a schedule for implementation of any measures to be taken to prevent or mitigate the delay
- Ormet Primary's rational for attributing the delay to a force majure event, if it desires to assert such a claim
- a statement as to whether, in the opinion of Ormet Primary, the event may cause or contribute to an endangerment to public health, welfare, or the environment

A force majure event is defined in the Consent Decree as any event arising from causes beyond the control of Ormet Primary, or of any entity controlled by Ormet Primary, that delays or prevents the performance of any obligation under the Consent Decree, despite Ormet Primary's best efforts to fulfill the obligation.

In the event that Ormet Primary and U.S. EPA disagree regarding whether a delay was caused by a force majure event and Ormet Primary wishes to invoke dispute resolution procedures, Ormet Primary must do so within 15 days after receipt of U.S. EPA's written decision.

3.2.4 Disputes

If the event of a dispute between Ormet Primary and U.S. EPA arising from the Consent Decree, the parties shall attempt to informally negotiate a resolution for a period not to exceed 20 days from the time the dispute arises, unless this time is modified by written agreement with the parties to the dispute.

In the event that the dispute is resolved to that satisfaction of both parties, Ormet Primary (if it so chooses) must invoke formal dispute resolution procedures by serving the United States a written Statement of Position on the matter within 10 days following conclusion of the informal negotiation period, or the position advanced by U.S. EPA shall be considered binding. Specific requirements regarding the formal dispute resolution procedures are presented in the Consent Decree.

4.0 PROCEDURES TO DOCUMENT AND TRACK INVESTIGATION DATA AND RESULTS

Specific procedures have been developed to ensure the integrity of all sample analysis data from the time of collection in the field to the tabulation of results. These procedures are presented in the stand-alone Sampling and Analysis Plan/Quality Assurance Project Plan. In brief, this plan requires that:

- each sample have an identifying label indicating the collection date, sample ID number, person collecting the sample, and constituents to be analyzed
- samples be listed on a chain-of-custody form, and be managed in accordance with chain-of-custody procedures
- Laboratory data will be tabulated and checked against the original laboratory report, and checked tables will be initialed by the checker and preserved in the project files

5.0 DATA DOCUMENTATION MATERIALS AND PROCEDURES

All data and documentation necessary to support the Remedial Design activities (e.g., copies of filed and laboratory data, final engineering calculations, final reports, etc.)

will be maintained in a main project file. As soon as each of the documents is generated, it will be routed to the project secretary for filing. Copies will be produced as needed.

5.1 Project File Requirements

The main project file will be maintained by the project secretary and will include copies of all ingoing and outgoing correspondence associated with the Remedial Design activities between the U.S. EPA, Ormet Primary, and the Supervising Contractor. In addition, copies of the following will be included in the project file:

- Progress reports
- Field notes and forms
- Draft and final reports and plans
- Original laboratory data
- Chain-of-custody forms
- Tabulated data tables

These documents will be routed to the project secretary for filing. The task files will be organized chronologically.

Records include all original copies of field notes and test and sampling results, and final copies of documents, drawings, and tabulations, including those prepared by subcontractors. The files will be audited periodically to remove drafts. All records regarding the results of sampling and/or tests or other data performed or collected at the facility shall be made available to the U.S. EPA pursuant to the terms of the Consent Decree.

6.0 RECORD RETENTION

Ormet Primary will preserve and retain all records or documents that relate to the performance of the Remedial Design and Remedial Action activities for a period of 10 years following its receipt of U.S. EPA's notification that it concludes that the work has been fully performed in accordance with the Consent Decree.

TABLE G-1

REPORTING AND NOTICE MILESTONES

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

ITEM	DUE DATE
Remedial Design Reports	
Preliminary Design (30 percent) Report including pre-design studies	One hundred and twenty (120) days after U.S. EPA's approval of Final RD Work Plan
Intermediate Design (60 percent) Report	Sixty (60) days after receipt of U.S. EPA's comments on the Preliminary Design
Prefinal Design (95 percent) Report	Sixty (60) days after receipt of U.S. EPA's comments on the Intermediate Design
Final Design (100 percent) Report	Sixty (60) days after receipt of U.S. EPA's comments on the Prefinal Design
Remedial Design Reports/Notices	
Award RA Contract(s)	Sixty (60) days after receipt of U.S. EPA's Notice of Authorization to Proceed with RA
Pre-Construction Inspection and Meeting	Fifteen (15) days after Award of RA Contract(s), weather permitting
Initiate Construction of RA	Fifteen (15) days after Pre-Construction Inspection and meeting, weather permitting
Completion of Construction	To be determined
Prefinal Inspection	No later than thirty (30) days after completion of construction
Prefinal Inspection Report	Thirty (30) days after completion of prefinal inspection
Final Inspection	Thirty (30) days after completion of work identified in prefinal inspection report
Final O&M Plan	No later than Prefinal Inspection
Construction Completion Report	Sixty (60) days after U.S. EPA-approved final inspection
Pre-certification Inspection	Ninety (90) days following attainment of Performance Standards for Ground Water

Monthly Progress Reports	By the fifteen (15th) day of the following month
Other Reports and Notices	
Notice of Sampling Activity	Twenty-eight (28) days prior to sampling, unless a shorter period is agreed to by U.S. EPA
Reportable Spill Events *(These reports are in addition to those required* under CERCLA and EPCRA)	Verbal report within twenty-four (24) hours of *onset of event* Event report within twenty days (20) of onset of event Completion report within thirty (30) days following completion of event
Delays and/or Force Majure Events	Verbal report within fourty-eight (48) hours of knowledge Written report within five (5) days of knowledge For disputes involving appropriateness of "Force Majure" determinations, must invoke dispute resolution within fifteen (15) days of reciept of U.S. EPA written decision
Disputes	Must serve "Statement of Position" within 10 days following the end of informal negotiation period (Note that informal negotiation period cannot extend more than 20 days from the time a dispute arises, unless agreed to in writing by both parties)
Remedial Action Completion Report	Thirty (30) days after the pre-certification inspection

APPENDIX H

WORK PLAN FOR AMENDMENT OF CRDA PCB CLEANUP STANDARD

APPENDIX H

WORK PLAN FOR AMENDMENT OF CRDA PCB CLEANUP STANDARD

ORMET PRIMARY SUPERFUND SITE
HANNIBAL, OHIO

INTRODUCTION AND BACKGROUND

The selected remedy for the Carbon Run-off and Deposition Area (CRDA) involves excavation of the CRDA down to native soil and consolidation of the material within the Construction Materials Scrap Dump (CMSD) prior to installation of the cap system. It also indicates that excavation will continue until the remaining (underlying) soil within the CRDA is shown to meet the Sediment Cleanup Standard (1 mg/kg for PCBs and 60 mg/kg for carcinogenic polynuclear aromatic hydrocarbons).

Ormet Primary has proposed that it be permitted to demonstrate that an alternate Cleanup Standard be considered for the underlying CRDA soils. The SOW provides Ormet Primary the opportunity to petition U.S. EPA for an amended soil Cleanup Standard for PCBs based upon industrial land use scenarios if it can demonstrate during Remedial Design that run-off from the CRDA will not adversely impact sediments in the Backwater Area. U.S. EPA has indicated that its criteria for determination of adverse impact to the Backwater Area is whether future erosion would cause the sediments to exceed the 1 mg/kg PCB Sediment Cleanup Standard.

Ormet Primary may or may not petition U.S. EPA for an amended PCB Soil Cleanup Standard during the Remedial Design. However, in the event that Ormet Primary pursues such a petition, it will likely involve an evaluation of the potential for future impact to the Backwater Area based upon the following considerations. This evaluation will be performed in general conformance with the U.S. EPA document entitled *Guidance on Remedial Actions for Superfund Sites with PCB Contamination* and consistent with this document, the Post-Remedial Action PCB Concentration will not exceed 10 mg/kg.

EVALUATION OF FUTURE IMPACT POTENTIAL

In addition to process water and effluent from the ground water treatment system, the Backwater Areas receives storm water discharges (and accompanying sediment) from the CRDA, CMSD, and 004 Outfall. As part of Remedial Action, the discharge from the 004 Outfall will be re-routed to bypass the Backwater Area. In order to evaluate possible future impact to the Backwater Area, Ormet Primary will perform a "mass balance" assessment of sediment loading to the Backwater Area.

The assessment will be performed in consideration of anticipated post-Remedial Actions site conditions (i.e., following closure of the CMSD). The potential future impact will be evaluated by partitioning the drainage area contributing to the Backwater Area into subdrainage areas of similar physical characteristics (slope, soil type, vegetative cover, etc.). The future soil erosion loss (i.e., sediment available for discharge to the Backwater Area) from each subdrainage area will then be estimated using accepted engineering methods, such as the U.S. Department of Agriculture, Soil Conservation Service's *Universal Soil Loss Equation* (USLE). The resulting estimates, will be expressed as an erosion loss rate (in tons per acre per year) for each subdrainage area.

In order to calculate the potential impact of soil erosion from the CRDA upon the Backwater Area, the erosion rates calculated for each subdrainage area will be multiplied by the corresponding surface area to estimate the potential sediment loading (in tons per year). The sediment loading values from each subdrainage area will then be multiplied by a representative PCB concentration for each area. These PCB concentration values (i.e., concentration multiplied by sediment loading) for each subdrainage area will be summed and divided by the total sediment loading of the entire drainage area. The resulting weighted concentration will be used to assess potential impact of CRDA PCB concentrations on the Outfall 004 backwater area.

REPORTING

The petition for amendment of the CRDA PCB Cleanup Standard if pursued by Ormet Primary, will be provided to U.S. EPA with the Preliminary Design submittal. The petition will provide a narrative summary of the methodology used for the evaluation and/or design, a copy of all applicable drawings and calculations, and a discussion of the results that presents specific conclusions and recommendations.

REFERENCES

U.S. Environmental Protection Agency (U.S. EPA), Guidance on Remedial Actions for Superfund Sites with PCB Contamination, Office of Emergency and Remedial Response, Washington, D.C., EPA/540/G-90/007. August 1990.

APPENDIX I

CALCULATION OF RESIDUAL RISK ASSOCIATED WITH EXPOSURE TO CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS IN FSPSA SOILS FOLLOWING COMPLETION OF SOIL FLUSHING

CALCULATION OF RESIDUAL RISK ASSOCIATED WITH EXPOSURE TO CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS IN FSPSA SOILS FOLLOWING COMPLETION OF SOIL FLUSHING

Data obtained during the bench-scale, soil flushing treatability study described in Appendix E will be used to calculate the level of residual risk associated with exposure to carcinogenic polynuclear aromatic hydrocarbon (cPAH) compounds in soil during hypothetical excavation activities in the former spent potliner storage area (FSPSA) following termination of soil flushing. Because the FSPSA is located in a portion of the Ormet Primary site that is visited infrequently by site workers, exposure of an excavation worker during possible future expansion of the industrial facility represents the highest potential level of future exposure to the soils in that area.

Pathways of exposure to soil that will be evaluated under the hypothetical excavation worker scenario include incidental ingestion, dermal contact, and inhalation of dust. Exposure point concentrations used in the calculation of residual risk will be determined based on analyses of residual cPAH concentrations in bulk soil samples following completion of the bench-scale soil flushing study described in Appendix E.

DETERMINATION OF RESIDUAL SITE RISKS

Equations and assumptions used in determining whether the residual risks exceed the 10^{-4} guideline are based on Ohio EPA (OEPA, 1993) and USEPA (1991) guidance. The assumptions that will be used to assess the residual risks of the soils are as follows:

(1) body weight of 70 kg (OEPA, 1993; USEPA 1991);

(2) soil ingestion rate of 480 mg/day (USEPA, 1991);

(3) breathing rate of 0.83 m^3/hr (OEPA, 1993);

(4) soil adherence rate of 1.0 mg/cm^2/day (OEPA, 1993);

(5) exposed skin surface area of 3,200 cm^2 for an adult wearing a short-sleeved, open-necked shirt, pants, and shoes, *with no gloves or hat (OEPA, 1993);*

(6) dermal absorption factor for cPAH compounds of 0.10; (OEPA, 1993);

(7) exposure frequency of 5 days/week;

(8) exposure duration of 12 weeks;

(9) exposure time of 8 hours/day; and

(10) exposure averaging period of 70 years for carcinogens (OEPA, 1993; USEPA, 1991).

The equations that will be used to calculate the residual risk levels are shown in Table 1. Dermal exposure to the PAHs will not be quantitatively evaluated because the mechanism of toxicity via dermal contact differs significantly from either the oral or inhalation route of exposure, and toxicity values have not been developed for dermal exposure to PAHs. Therefore, the USEPA has recommended that dermal exposure to PAHs should not be quantified (USEPA, 1993). However, a qualitative assessment of the risk associated with dermal contact will be included with the evaluation.

Total residual risk levels will be calculated for the sum total of the residual risks for the individual constituents. These total residual risk levels will be compared with a guideline target excess lifetime cancer risk level of 10^{-4}.

REFERENCES

Ohio Environmental Protection Agency (OEPA), 1993 Guidance for Reviewing Risk-Based Closure Plans for RCRA Units. Division of Hazardous Waste Management, Columbus, Ohio.

U.S. Environmental Protection Agency (USEPA), 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Research and Development, Washington, DC. EPA/600/R-93/089.

U.S. Environmental Protection Agency (USEPA), 1991. Risk Assessment Guidance for Superfund, Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors. Office of Emergency and Remedial Response, Washington, D.C.